PB90-138405

Superfund Record of Decision (EPA Region 5)
Ott/Story/Cordova Chemical Site, North Muskegon, Michigan
(First Remedial Action), September 1989

(U.S.) Environmental Protection Agency, Washington, DC

29 Sep 89

U.S. Department of Commerce
National Technical Information Service
NTIS

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Office of
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Remedial Response

EPA/ROD/R05-89/111
September 1989

EPA

Superfund Record of Decision:

Ott/Story/Cordova Chemical, MI

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Ott/Story/Cordova Chemical, MI
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16. Abstract (Limit: 200 words)

The Ott/Story/Cordova site is in Dalton Township, Muskegon County, Michigan. Beginning in 1957, various specialty organic chemical manufacturers operated at the site, producing intermediate items used in making pharmaceuticals, dyestuffs, and agricultural chemicals. Soil and water contamination was noted as early as the 1960s, probably resulting from discharge of production vessel clean out wastes and wastewaters to onsite unlined lagoons, and drums of waste that were accumulated onsite. In 1977 several thousand cubic yards of lagoon sludges and several thousand drums were removed by the State, and in 1982 an alternate water supply was provided to residents in the vicinity of the site. Subsequent investigations detected significant degradation of Little Bear Creek and its unnamed tributary, which flow past the site to the east, as a result of contaminated ground water. Due to the complexity of the site the cleanup will be organized into two distinct operable units. This first operable unit addresses the interception of contaminated ground water entering the Little Bear Creek system. The second operable unit will address contaminated soil, possible ground water remediation, source control, and air and water monitoring. The primary chemicals of concern affecting the ground water and surface water are VOCs including benzene, PCE, TCE, toluene, vinyl chloride, and xylene; other organics including PCBs and pesticides; and metals including arsenic. (See Attached Sheet)

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17. Document Analysis a. Descriptors
Record of Decision - Ott/Story/Cordova Chemical, MI
First Remedial Action
Contaminated Media: gw, sw
Key Contaminants: VOCs (benzene, PCE, TCE, toluene, xylene), other organics (PCBs, pesticides), metals (arsenic)

b. Identifiers/Open-Ended Terms

c. COSATI Field/Group

18. Availability Statement

19. Security Class (This Report) None

20. Security Class (This Page) None

21. No. of Pages 103

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(See ANSI-Z39.18)

See Instructions on Reverse

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(Formerly NTIS-35)
Department of Commerce

EPA/ROD/R05-89/111
Ott/Story/Cordova Chemical, MI
First Remedial Action

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16. Abstract (continued)

The selected remedial action for this site are includes pumping and treatment of ground water that would otherwise enter the Little Bear Creek system using UV-oxidation, carbon adsorption, biological treatment (activated sludge), and filtration with discharge to surface water; and environmental monitoring. The estimated present worth cost for this remedial action is $11,751,000, which includes estimated annual O&M costs of $1,500,000 to 1,600,000 for years 1-5.

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DIRECT QUESTIONS RESULTING FROM ILLEGIBILITY

TO: U.S. EPA
OSWER - HSCD

DECLARATION FOR THE RECORD OF DECISION

Statutory preference for treatment as a principal element of this Record of Decision is met; five-year site review is required

SITE NAME AND LOCATION

Ott/Story/Cordova Site
North Muskegon, Michigan

STATEMENT OF BASIS AND PURPOSE

This decision document presents the selected remedial action for the Ott/Story/Cordova Site, in North Muskegon, Michigan, developed in accordance with CERCLA, as amended by SARA, and to the extent practicable, the National Contingency Plan. This decision is based on the administrative record file for this site.

The State of Michigan concurs on the selected remedy.

ASSESSMENT OF THE SITE

Actual or threatened releases of hazardous substances from this site, if not addressed by implementing the response action selected in this ROD, present an imminent and substantial endangerment to public health, welfare, or the environment.

DESCRIPTION OF THE SELECTED REMEDY

This operable unit is the first of two planned for the site. The first operable unit addresses the contamination of the Little Bear Creek system. The function of this operable unit is to intercept the flow of contaminated groundwater into Little Bear Creek and its unnamed tributary, and to provide adequate treatment of groundwater thus collected. While the remedy does address one of the principal threats at the site, the second unit will involve possible remediation of contaminated site soils, remediation of possible continuing sources of contaminants, possible remediation of the downgradient contaminant plume, and accompanying air and water monitoring so as to properly monitor remediation/recovery efforts. This first operable unit is consistent with achieving a permanent remedy.

The major components of the current selected remedy include:

- Installation of extraction wells to intercept flow of contaminated groundwater which would otherwise enter the Little Bear Creek system;

- Provide for adequate treatment of groundwaters thus collected such that the resultant discharge will meet NPDES limitations as imposed by the program administered by the State of Michigan;

- Conduct environmental monitoring to ensure the effectiveness of the remedial action.

DECLARATION OF STATUTORY DETERMINATIONS

The selected remedy is protective of human health and the environment, complies with Federal and State requirements that are legally applicable or relevant and appropriate to the remedial action, and is cost-effective. This remedy utilizes permanent solutions and alternative treatment technologies to the maximum extent practicable for this site, and satisfies the statutory preference for remedies that employ treatment that reduces toxicity, mobility, or volume as a principal element.

Because this remedy will result in hazardous substances remaining on-site above health-based levels, a review will be conducted within five years after commencement of remedial action to ensure that the remedy continues to provide adequate protection of human health and the environment.

9/29/89.
Date

Frank M. Covington
Signature (Regional Administrator)

RECORD OF DECISION
DECISION SUMMARY

1. SITE NAME, LOCATION, AND DESCRIPTION

The Ott/Story/Cordova site is located in Dalton Township, Muskegon County, Michigan, approximately five miles north of the City of Muskegon (see Figure 1). The site is in what may be termed the northernmost vicinity of the Greater Muskegon area.

2. SITE HISTORY AND ENFORCEMENT ACTIVITIES

Site operations began approximately 1957. The site was host to various specialty organic chemical manufacturers. Products made over the span of active operations included intermediate items used in the making of pharmaceuticals, dyestuffs, and agricultural chemicals.

Production vessel clean out wastes and wastewaters were all initially discharged to on-site unlined lagoons and allowed to dissipate by seepage. The accumulation of drums of waste was also allowed to occur.

By the 1960s, signs of water and soil contamination were beginning to be noted. A program, later characterized by some Michigan Department of Natural Resources (MDNR) members as largely ineffectual, to slow the spread of a plume of groundwater contamination, was begun.

By 1977, with the then site owner bankrupt, a removal program was undertaken by the State of Michigan and financed by the new site owner. Several thousand drums and cubic yards of lagoon sludges were removed.

In 1982, the site was placed on the National Priorities List. Also in 1982, an alternate water supply was installed in the vicinity of the site by the parent company of a former site owner in settlement of a citizens' suit. In January 1988, U.S. EPA's REM IV contractor began Remedial Investigation (RI) field work at the site.

Three distinct sets of site owner/operators have occurred. The Ott Chemical Company began operations at the site in the 1950s as an independent company. In 1965, Corn Products Company, now CPC International, purchased all stock of Ott Chemical. In 1972, CPC sold assets that comprised Ott operations to Story Chemical. In late 1976-early 1977, Story began bankruptcy proceedings. In late 1977-early 1978, Cordova Chemical Company of Michigan purchased the site after entering into an agreement with the State of Michigan. The agreement called for Cordova to destroy or neutralize phosgene gas supplies left at the site, and to finance Michigan so as to remove drums of waste and lagoon sludges. In return, Michigan agreed to limit Cordova's liability for future site releases caused by past activities.

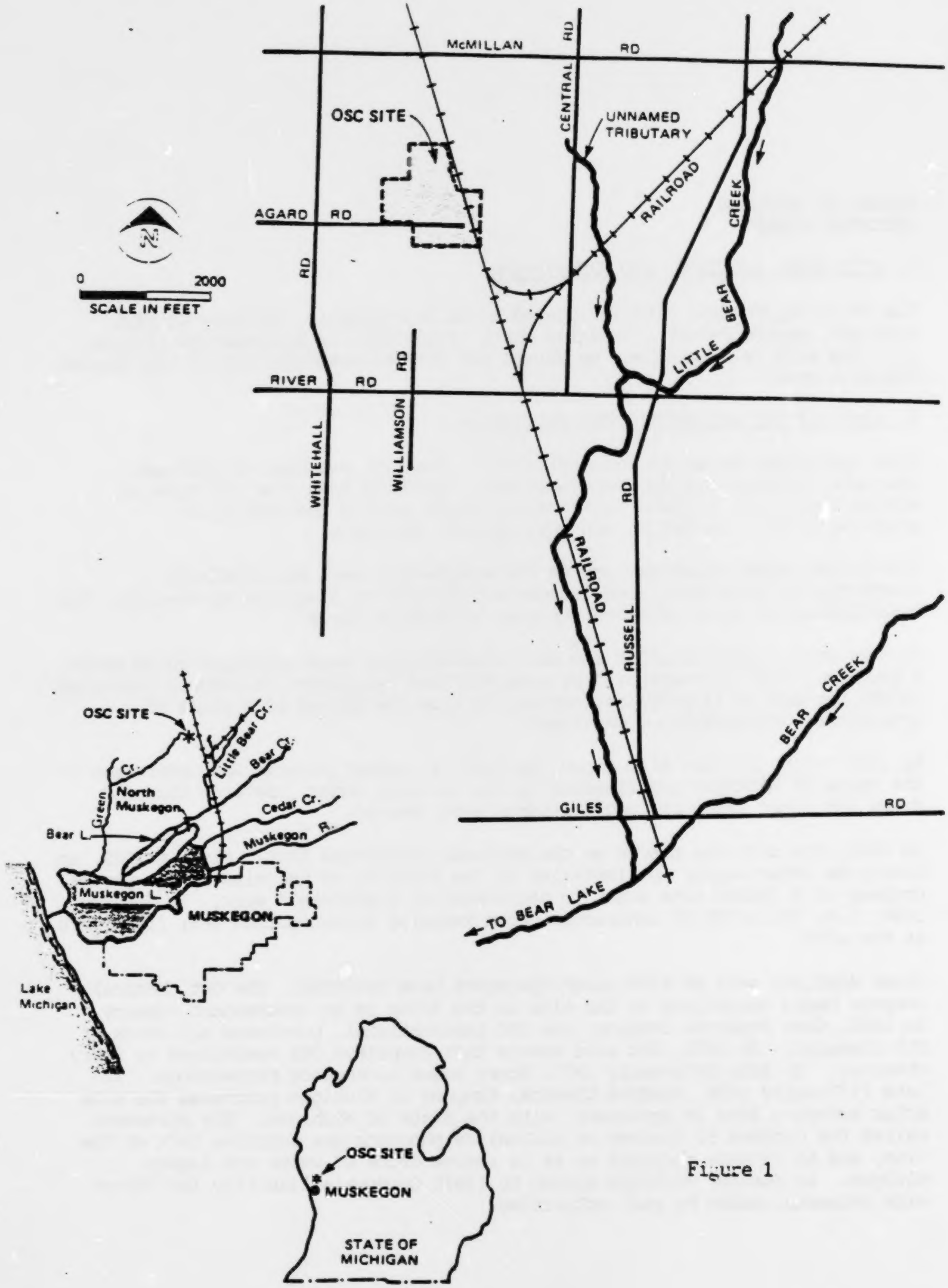
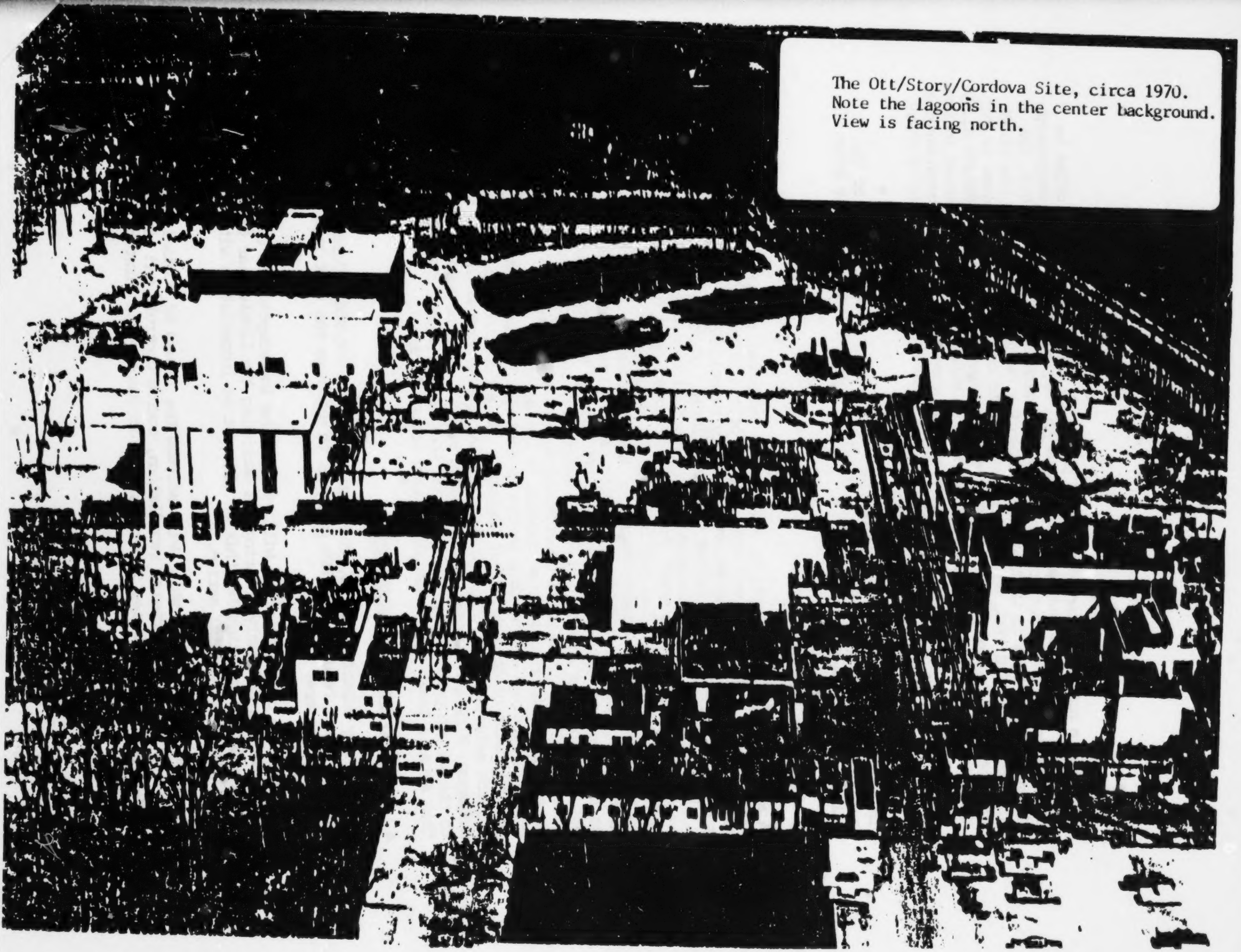

McMILLAN RD
CENTRAL RD
OSC SITE
UNNAMED TRIBUTARY
RAILROAD
AGARD RD
LITTLE BEAR CREEK
0
2000
SCALE IN FEET
RIVER RD
WHITEHALL RD
WILLIAMSON RD
RUSSELL RD
RAILROAD
GILES RD
BEAR CREEK
TO BEAR LAKE
OSC SITE
Little Bear Cr.
Bear Cr.
Cr.
Green
North Muskegon
Cedar Cr.
Muskegon R.
Bear L.
Muskegon L.
MUSKEGON
Lake Michigan
OSC SITE
MUSKEGON
STATE OF MICHIGAN

Figure 1



The Ott/Story/Cordova Site, circa 1970.
Note the lagoons in the center background.
View is facing north.

In 1985, a notice letter advisory of potential site liability and offer to conduct a site RI/FS was sent to Cordova and CPC by U.S. EPA. No settlement was reached over private conduct of the RI/FS; hence in May 1986, U.S. EPA informed these PRPs in writing of the Agency's decision to perform the RI/FS. In March 1989, U.S. EPA sent demand letters for cost recovery purposes to CPC and Cordova. In May 1989, U.S. EPA informed Aerojet-General and Swanton-Story Corporation of potential liability as regards this site and sent demand letters to these firms. Both Aerojet-General and Swanton-Story Corp. are considered as PRPs. Aerojet owns Cordova Chemical. Swanton-Story is what remains of Story Chemical after bankruptcy proceedings.

In August 1989, PRPs were given notice via a Section 122(a) letter of the availability of the Proposed Plan Focused Feasibility Study, and the start of public comment period.

3. COMMUNITY PARTICIPATION

A RI/FS "Kickoff" availability session was held near the site in November 1987. Upon its completion in April 1989, a copy of the RI report was made available to the public at the information repository maintained at the Dalton Township Public Hall and also the Walker Memorial Library in North Muskegon. The RI was also made a part of the administrative record file maintained in Region 5 and at the local facilities noted above. The Focused Feasibility Study (FFS) notice of availability was published in the Muskegon Chronicle on July 27, 1989 to initiate a public comment period on the alternatives from August 1, 1989 to August 31, 1989. In addition, a public meeting was held on August 16, 1989. At this meeting, representatives from EPA and the Michigan Department of Natural Resources answered questions about site conditions, problems, and remedial alternatives under consideration. Subsequently, EPA extended the period for receipt of written comment to September 19, 1989. A response to the comments received during this period is included in the Responsiveness Summary, which is part of this Record of Decision. This decision document presents the current selected remedial action for the Ott/Story/Cordova Site in North Muskegon, Michigan, chosen in accordance with CERCLA, as amended by SARA, and to the extent practicable, the National Contingency Plan. The decision for this site is based on the administrative record file.

4. SCOPE AND ROLE OF OPERABLE UNIT

As with many Superfund sites, the problems at the Ott/Story/Cordova site are complex. As a result, U.S. EPA proposes to organize the work into two distinct units. These are:

- An operable unit (OU) which will address the interception of contaminated groundwaters presently entering and degrading the Little Bear Creek system. To the degree practicable, this OU will not be inconsistent with other possible site remedial action.

- A second operable unit which will address the issues of contaminated site soils, possible groundwater remediation, source control, and air/water monitoring efforts needed to evaluate effectiveness and duration of remedial actions.

This Record of Decision concerns the first operable unit noted for the Ott/Story/Cordova site. RI data show that Little Bear Creek and its unnamed tributary are degraded by the discharge of contaminated groundwater. The Ott/Story/Cordova site served and continues to serve as the principal source of the groundwater contaminants. Little Bear Creek has been degraded to the point that the Michigan Department of Public Health found it necessary to request the Muskegon County Health Department to post signs in the stream bed warning potential users of contaminated water.

The second OU will consider the threats posed by site soils, and will consider what if any restoration efforts should be undertaken for the contaminated aquifer. This aquifer once served as a drinking water supply, but in its present state poses a threat to potential future users.

5. SUMMARY OF SITE CHARACTERISTICS

An important site characteristic at Ott/Story/Cordova is the sandy nature of site soils which result in a high permeability. Past waste seepage practices and subsequent plant spills/releases have resulted in many increments of pollutant introduction into the groundwater system. The RI revealed over 90 different organic compounds in the groundwater, of which 32 are classified as priority pollutants. Surface and subsurface soils at Ott/Story/Cordova were also found to be contaminated.

The surface water samples collected from Little Bear Creek and its unnamed tributary were found to be contaminated with many of the same compounds found in other contaminated media at the site. The sources of the surface water contamination are seeps of upwelling groundwater located along Little Bear Creek and its unnamed tributary. The following table shows higher contaminant concentrations at various spots in soil, groundwater, and surface water around the Ott/Story/Cordova site:

	POINT	SUBSTANCE	CONC.
SURFACE SOIL (results in ug/kg)	SF-02W	Benzoic Acid	6000
		4,4'-DDT	25000
	SF-20	1,2-Dichlorobenzene	11000
		Benzoic Acid	75000
	SF-6	4-Chloroaniline	1200
SUBSURFACE SOIL (Shallow) (results in ug/kg)	SB-07	1,1,1-Trichloroethane	17000
		Xylene	79000
		Toluene	1600
	SB-24	1,4-Dichlorobenzene	7600
		1,2-Dichlorobenzene	13000
		Hexachlorobenzene	7800

GROUNDWATER (results in ug/l)	OW-12 (near unnamed tributary)	Vinyl Chloride	50000
		1,1-Dichloroethene	1100
		1,1-Dichloroethane	2400
		1,2-Dichloroethane	110000
		Toluene	3200
		Benzoic Acid	1300
GROUNDWATER	POINT	SUBSTANCE	CONC.
(results in ug/l)	OW-9 (about 1/3 distance from former plant to Creek)	Vinyl Chloride	130000
		1,1-Dichloroethene	7900
		1,1-Dichloroethane	6300
		1,2-Dichloroethane	21000
SURFACE WATER (results in ug/l)	Near confluence of unnamed tributary and Little Bear Creek	Chloroform	85
		Vinyl Chloride	52
		1,1-Dichloroethane	26
		1,2-Dichloroethane	140
		Benzene	26
		Toluene	22
		Aniline	17

Tentatively Identified Compounds (TICs)

N-Methyl Benezeneamine	24
N,N-Dimethyl Benzeneamine	100
N-Ethyl Benzeneamine	27

6. SUMMARY OF SITE RISKS

Introduction

Numerous chemical compounds were detected during the course of Ott/Story/Cordova field investigations. As is explained in further detail in the Remedial Investigation report, some 90 organic compounds were detected in groundwater, 15 in surface water samples, and over 200 organic compounds were detected in site soil samples. Inorganic compounds were also detected in these same environmental media. Data sets were evaluated to consider those chemicals above background levels, toxicity constants for noncarginogens and carcinogens were reviewed, and the degree of occurrence of a given substance at the site was considered.

Based on this evaluation, twenty two indicator chemicals were selected at the Ott/Story/Cordova site which appeared to not only to be present in significant concentrations, but also exhibit the potential for relatively high toxicity. These substances are:

1,1,2-Trichloroethane
1,2-dichloroethane
1,1-dichloroethene
trichloroethene
carbon tetrachloride
benzene
heptachlor epoxide
xylene
toluene
4,4'-DDT
silver
barium
zinc
copper
nickel

vinyl chloride
chloroform
tetrachloroethene
PCB
dichloromethane
cyanide
arsenic

EXPOSURE ASSESSMENT

During early production periods at the site, releases of contaminants occurred either to the air or soil. Since production activities have now been curtailed, it is assumed that all present releases from the site resulted from previous releases to soil.

Once in soil, further releases can occur by movement of contaminants into groundwater and the subsequent discharge to surface water, volatilization into the air or suspension of contaminated dusts into the air, or runoff of surface water that may carry contaminated soils. Because of the porous nature of soils at Ott/Story/Cordova, soil runoff to surface water is considered as minor pathway for contaminant movement. However, contamination of groundwater and its resultant movement is of major concern at Ott/Story/Cordova.

The movement of contaminated groundwater poses several exposure pathways. Users of groundwater are considered a potentially exposed population. Formerly, several residents near the site were supplied by individual groundwater wells. In 1982, consequent to a settlement of a citizens' suit, a past owner/operator of the site funded an extension of an alternate water supply to the area. In recent years, the Muskegon County Health Department has found it necessary to warn residents near the site not to use groundwater for watering lawns or gardens; such usage can present either an ingestion or inhalation pathway.

Other pathways are presented when a portion of the contaminated groundwater upwells into the Little Bear Creek system. Consequently, aquatic organisms are exposed to pollutants. Volatilization of contaminants from surface water into the air represents a pathway. Ingestion or dermal contact with surface waters by human populations is also a route of exposure. Signs warning potential users of contaminated water in the stream have been posted by the Muskegon County Health Department at the request of the Michigan Department of Public Health. Although the number of workers at the existing plant now consists of a minimal "skeleton crew", contaminants in soils onsite may lead to exposure via dermal contact or ingestion to those workers.

The groundwater at Ott/Story/Cordova may be classified as a Class II supply. Prior to the present contamination, groundwater once served as a source of drinking water.

In developing exposure scenarios, both "base case" and "high exposure case" were considered. The base case represents an estimate of average exposures, using average concentrations and contact rates. The high exposure case uses highest detected environmental concentrations and higher than normal contact rates. The number of base exposure visits per year were estimated at 0 (ages 0-1), 2 (age 1-6) and 10 (age 6-76). High exposure visits were estimated at 0 (ages 0-1), 4 (ages 1-6), and 20 (ages 6-76). Base exposure visits were assumed to last 3-4 hours; high exposure visits 6-8 hours. Pending age group, air inhalation was assumed to be from 7.5 m^3/day to 20 m^3/day. Soil ingestion rates for base cases were 50 mg/day for all age groups except children aged 1-6 years. For this group, the rate of soil ingestion was 100 mg/day.

TOXICITY ASSESSMENT

The degree of toxicity which may be posed by a given chemical may be described in part by its acceptable intake for subchronic exposure (AIS), its reference dose or acceptable intake for chronic exposure (AIC), and in the case of carcinogens by its carcinogenic potency factor. Values for AIS and AIC are derived from information available from studies on animals or human epidemiologic studies. These values are normally reported in mg/kg body weight/day, and generally represent the highest calculated exposure level below which the given adverse effect will not occur. A carcinogenic potency factor is expressed as lifetime cancer risk per mg/kg body weight/day, and is estimated at the upper 95 percent confidence limit of the carcinogenic potency of a given chemical.

Cancer potency factors (CPFs) have been developed by EPA's Carcinogenic Assessment Group for estimating excess lifetime cancer risks associated with exposure to potentially carcinogenic chemicals. CPFs, which are expressed in units of $(mg/kg\text{-}day)^{-1}$, are multiplied by the estimated intake of a potential carcinogen, in mg/kg-day, to provide an upper-bound estimate of the excess lifetime cancer risk associated with exposure at that intake level. The term "upper bound" reflects the conservative estimate of the risks calculated from the CPF. Use of this approach makes underestimation of the actual cancer risk highly unlikely. Cancer potency factors are derived from the results of human epidemiological studies of chronic animal bioassays to which animal-to-human extrapolation and uncertainty factors have been applied.

Reference doses (RfDs) have been developed by EPA for indicating the potential for adverse health effects from exposure to chemicals exhibiting noncarcinogenic effects. RfDs, which are expressed in units of mg/kg-day, are estimates of lifetime daily exposure levels for humans, including sensitive individuals. Estimated intakes of chemicals from environmental media (e.g., the amount of a chemical ingested from contaminated drinking water) can be compared to the RfD. RfDs are derived from human epidemiological studies or animal studies to which uncertainty factors have been applied (e.g., to account for the use of animal data to predict effects on humans). These uncertainty factors help ensure that the RfDs will not underestimate the potential for adverse noncarcinogenic effects to occur.

The following two tables describe AIC, AIS, and carcinogenic potency factors for indicator chemicals at the Ott/Story/Cordova site. The third table lists the weight of evidence for the various categories of potential carcinogens.

AIC AND AIS VALUES FOR INDICATOR CHEMICALS AT THE OTT/STORY/CORDOVA SITE

Indicator Chemical	Acceptable Intake: Ingestion Route Subchronic (AIS) mg/kg/day	Acceptable Intake: Ingestion Route Chronic (AIC) mg/kg/day	Acceptable Intake: Inhalation Route Subchronic (AIS) mg/kg/day	Acceptable Intake: Inhalation Route Chronic (AIC) mg/kg/day
1,2-Dichloroethane				
1,1-Dichloroethene				
Arsenic		0.009		
Carbon Tetrachloride				
Vinyl Chloride		0.0007a		
Chloroform				
Tetrachloroethene		0.01		
Benzene		0.01a		
1,1,2-Trichloroethane				
Heptachlor Epoxide		0.004a		
Silver		0.000013a		
Barium		0.003		
Zinc		0.05a	0.0014	0.00014
Copper	0.21	0.21	0.1	0.01
Nickel	0.037	0.037		
Trichloroethene	0.02	0.02a		
toluene				
Cyanide	0.43	0.30	1.5	1.5
Methylene chloride		0.02		
Xylene		0.06		
4,4'-DDT	0.1	2a	0.69	0.4
PCB		0.0005		

Primary Source: USEPA, 1986a

a - Source: RfD; EPA IRIS database (12/1/88)

CARCINOGEN POTENCY FACTORS FOR INDICATOR CHEMICALS AT THE OTT/STORY/CORDOVA SITE

	Ingestion Route		Inhalation Route	
Indicator Chemical	Potency Factor $(mg/kg/d)^{-1}$	EPA Weight of Evidence	Potency Factor $(mg/kg/d)^{-1}$	EPA Weight of Evidence
1,2-Dichloroethane	0.091	B2	0.091a	B2
1,1-Dichloroethene	0.58	C	1.16	C
Arsenic	1.65b	A	15a	A
Carbon tetrachloride	0.13	B2	0.13a	B2
Vinyl Chloride	2.3	A	0.295a	A
Chloroform	0.0061a	B2	0.081a	B2
Tetrachloroethene	0.051	B2	0.0033a	B2
Benzene	0.029a	A	0.029a	A
1,1,2-Trichloroethane	0.0573	C	0.057a	C
Heptachlor Epoxide	9.1	B2	9.1	B2
Silver				
Barium				
Zinc				
Copper				
Nickel		A	1.19	A
Trichloroethene	0.011	B2	0.013a	B2
Toluene				
Cyanide				
Methylene chloride	0.0075	B2	0.0143	B2
Xylene				
4,4'-DDT	0.34	B2		B2
PCB	7.7	B2		B2

Primary Source: EPA, 1986
a - Source: RfD; EPA IRIS database (revised 12/1/88)
b - USEPA, 1987

EPA WEIGHT OF EVIDENCE
CATEGORIES FOR POTENTIAL CARCINOGENS

EPA Category	Description of Group	Description of Evidence
Group A	Human Carcinogen	Sufficient evidence from epidemiologic studies to support a causal association between exposure and cancer.
Group B1	Probable Human Carcinogen	Limited evidence of carcinogenicity in humans from epidemiologic studies
Group B2	Probable Human Carcinogen	Sufficient evidence of carcinogenicity in animals, inadequate evidence of carcinogenicity in humans
Group C	Possible Human Carcinogen	Limited evidence of carcinogenicity in animals
Group D	Not Classified	Inadequate evidence of carcinogenicity in animals
Group E	No Evidence of Carcinogenicity in Humans	No evidence of carcinogenicity in at least two adequate animal tests or in both epidemiologic and animal studies

7. RISK CHARACTERIZATION

Excess lifetime cancer risks are determined by multiplying the intake level with the cancer potency factor. These risks are probabilities that are generally expressed in scientific notation (e.g., $1x10^{-6}$ or 1E-6). An excess lifetime cancer risk of $1x10^{-6}$ indicates that, as a plausible upper bound, an individual has a one in one million chance of developing cancer as a result of site-related exposure to a carcinogen over a 70-year lifetime under the specific exposure conditions at a site.

Potential concern for noncarcinogenic effects of a single contaminant in a single medium is expressed as the hazard quotient (HQ) (or the ratio of the estimated intake derived from the contaminant concentration in a given medium to the contaminant's reference dose). By adding the HQs for all contaminants within a medium or across all media to which a given population may reasonably be exposed, the Hazard Index (HI) can be generated. The HI provides a useful reference point for gauging the potential significance of multiple contaminant exposures within a single medium or across media.

The Agency considers excess cancer risk in the range of 10^{-4} to 10^{-7} as protective of human health. The risk level of 10^{-6}, which represents a probability of one in one million that an individual could contract cancer under the conditions of exposure, is often used as a "benchmark" of protection. Given the relative proximity of potential receptors to the site, a risk level of 10^{-6} appears appropriate for this site.

Given current land usage, the estimated excess cancer risks for three indicator chemicals are greater than 10^{-6} under base exposure assumptions. These are:

PATHWAY	INDICATOR CHEMICAL	CANCER RISK (base case)
inhalation	1,2-dichloroethane	7×10^{-5}
inhalation	1,1-dichloroethene	1×10^{-5}
inhalation	benzene	2×10^{-5}

Hence, a potential health risk is posed due to inhalation of ambient air.

Given current land usage, excess cancer risks were greater than 10^{-6} under high exposure assumptions for six indicator chemicals. These are:

PATHWAY	INDICATOR CHEMICAL	CANCER RISK (high exposure case)
inhalation	1,2-dichloroethane	6×10^{-4}
inhalation	1,1-dichloroethene	2×10^{-4}
inhalation	benzene	1×10^{-4}
inhalation	1,1,2-trichloroethane	1×10^{-6}
ingestion	Arsenic	1×10^{-6}
ingestion	PCB	6×10^{-6}

Hence, a potential health risk is posed due to inhalation of ambient air for the first four compounds given above, while a health risk due to incidental ingestion of soils at the facility is posed by the last two. It should be noted that volatilization of chemicals from surface water is a source of air pollutants. Additive excess cancer risk due to inhalation of indicator chemicals is 1×10^{-4} for base exposure and 9×10^{-4} under high exposure conditions.

Regarding future land usage, it was assumed that the site might undergo either residential or commercial development. For residential development, ingestion of DDT contaminated soil may pose a problem under high exposure conditions. A chronic hazard index of 1.67 (>1) was calculated for children ages 1-6. Future residential developmental of the site would also pose a potential soil ingestion health risk for carcinogenic substances as shown below:

PATHWAY	INDICATOR CHEMICAL	CANCER RISK (base)	(high)
ingestion	Arsenic	3×10^{-6}	3×10^{-5}
ingestion	PCB	4×10^{-6}	4×10^{-4}
ingestion	4,4'-DDT	-	3×10^{-5}

For future commercial development of this site, a potential soil ingestion health risk for carcinogenic substances in posed under a high exposure scenario as shown below:

INDICATOR CHEMICAL	CANCER RISK
Arsenic	2×10^{-6}
PCB	3×10^{-5}
4,4'-DDT	2×10^{-6}

Risks to potential ground water users were also calculated. Risks were estimated assuming that a given monitoring well served as a water supply source. Chronic hazard index values and base case cancer risks were estimated for indicator chemicals found in each well.

The chronic hazard index value exceeded unity in 19 monitoring wells. Hence, were the groundwater used in its present state, it may pose a health risk with regard to noncarcinogenic chemicals.

With regard to carcinogenic indicator chemicals, cancer risks for at least one compound exceeded 1×10^{-6} in 22 wells. Particularly striking were results obtained in monitoring wells OW12 and OW9. Vinyl chloride concentrations in these wells were found to be at such levels that the excess cancer risk from this compound alone was found to approach 1. Eight other wells exhibited instances of either vinyl chloride or 1,2-dichloroethane exceeding cancer risks of 1×10^{-1}.

These results indicate that any potential ingestion of groundwater from certain areas at the Ott/Story/Cordova site poses significant health risks.

The above discussions indicate that the risks from current and potential exposure to contaminated groundwater, soil, and surface water are unacceptable. Actual or threatened releases of hazardous substances from this site, if not addressed by implementing the response action selected in this Record of Decision, present an imminent and substantial endangerment to public health, welfare, or the environment.

8. DESCRIPTION OF ALTERNATIVES

Alternative 1 - No Action

Section 300.68(f)(1)(v) of the National Contingency Plan requires that the no action alternative be carried forward for consideration in the detailed analysis of alternatives as a baseline for comparison of other alternatives. Under this alternative, no funds would be expended for monitoring, control, or cleanup of contamination associated with the Little Bear Creek system.

Discharges of contaminated groundwater will continue to enter the unnamed tributary and Little Bear Creek if no action is taken.

The no action alternative does not provide protection of human health and the environment, and does not comply with applicable or relevant and appropriate Federal and State requirements (ARARs).

Alternative 2 - Extraction, Organic Contaminant Removal, Adsorption, Biological Treatment, Stream Discharge

The major features of this alternative include locating groundwater extraction wells in the vicinity of entry of seeps of contaminated groundwater into Little Bear Creek and its unnamed tributary, physical-chemical treatment to provide initial removal of organic contaminants, filtration to provide further contaminant and suspended solids removal, and biological treatment so as to yield enhanced removal of organics prior to stream discharge.

Modeling suggests that an appropriate combined extraction rate would be approximately 400 gpm. This should provide effective interception of contaminated groundwater within the unconfined aquifer.

The specific types of physical-chemical organic contaminants removal (e.g., UV-oxidation, air stripping), filtration (e.g. granular activated carbon), and biological treatment (e.g. activated sludge), will be determined in the Remedial Design phase through engineering design and analysis and the competitive bidding process.

Effluent quality must meet conditions as imposed by the Michigan-administered NPDES permit system. Air emissions must be shown to be in compliance with Michigan Air Rule 901 as demonstrated by Air Rule 203. Solids/sludges generated during wastewater treatment would be handled in accordance with RCRA rules on evaluation and management on and off site. Technical requirements imposed will be complied with, but since the action is on-site, Section 121(e) of CERCLA does not require compliance with administrative procedures.

It is estimated that this alternative would take approximately 18 to 20 months to implement. Its capital cost is $5,030,000 and present worth cost is $11,750,000. Cost may vary somewhat depending on carbon adsorption system selected, as well as physical-chemical treatment chosen.

Alternative 3 - Slurry Wall, Extraction, Organic Contaminant Removal, Adsorption, Biological Treatment, Stream Discharge

This alternative would utilize most features of Alternative 2. A principal difference is the installation of a slurry wall of approximately 1000 feet in length and 90 feet deep near Little Bear Creek. A primary benefit of such a wall would be the expected drop in volume of groundwater requiring treatment. Fewer extraction wells, with a total pumping rate of approximately 150 gpm, would be required.

The total time required to bring this alternative on line is estimated at between 19 and 21 months. Its capital cost is placed at $4,760,000, and its present worth is estimated as $9,500,000. Such costs may vary somewhat depending on design selection of carbon adsorption or physical chemical treatment chosen.

Alternative 4 - Extraction, Organic Contaminant Removal, Adsorption, POTW Discharge

This alternative would utilize most of the features of Alternative 2, with the exception of no biological treatment and discharge would be routed to the local POTW. Acceptable priority pollutant pretreatment conditions have been received from Muskegon County officials responsible for publicly operated treatment works (POTW) compliance. It is believed that such conditions can be met through employment of initial organic contaminant removal and filtration steps.

Construction time for this alternative is estimated at 18-20 months. Capital costs are placed at $3,140,000, with a present worth of $8,840,000.

Alternative 5 - Slurry Wall, Extraction, Organic Contaminant Removal, Adsorption, POTW Discharge

This alternative combines features of Alternatives 3 and 4. Via slurry wall construction and employment of extraction wells, approximately 150 gpm of water would be discharged into the POTW system after initial treatment for organic contaminant removal and adsorption. Construction time for this alternative is estimated at 19-21 months. Capital costs are placed at $3,600,000, with a present worth of $7,380,000

Alternative 6 - Trench Interceptor, Stream Discharge.

This proposal considers the installation of a french drain system of about 1000 feet in length placed on the west bank of the Little Bear Creek system. Trench backfill permeability would be on the order of 1×10^{-1} ft/sec, which would allow some 450 gpm of groundwater to enter the trench. Sloping would be from north to south, such that water collected would drain to a wet well equipped with a submersible pump. As advocated by one of the site PRPs, such flow would then be routed into the Muskegon County POTW. This alternative as originally proposed did not have a provision for pretreatment. As originally proposed by the PRP, this alternative would not have met ARARs, and would have

cost approximately $1,000,000. In order to give this concept full review, the Agency assumed a treatment system as noted in Alternative 2. Capital costs then are placed at $5,500,000, with a present net worth of $12,200,000. Time for installation is placed at 19-21 months.

SUMMARY OF COMPARATIVE ANALYSIS OF ALTERNATIVES

It is now appropriate to discuss some of the relative strengths and weaknesses of the alternatives given above. Later, each of the alternatives will be reviewed as to how well they compare to the criteria of overall protection of human health and the environment, compliance with ARARs, long-term effectiveness and permanence, reduction of toxicity, mobility, or volume through treatment, short-term effectiveness, implementability, cost, state acceptance, and community acceptance.

It should be noted that of the criteria listed above, overall protection of human health and the environment and compliance with ARARs are considered as threshold. If an alternative fails to meet these two criteria, it will not be considered further. The other criteria will be used to evaluate further those alternatives that are protective and are in compliance with ARARs.

Alternative 1 - No Action

As we have seen, signs warning of contaminated water have been placed in Little Bear Creek. A risk has also been identified with air inhalation at points within the stream's valley, and a chloroform level in Little Bear Creek exceeded the appropriate ambient water criterion by a factor of nearly two-fold. Additionally, levels of benzene, vinyl chloride, and 1,2-dichloroethane exceed drinking water criteria within Little Bear Creek. Vinyl chloride levels also exceed by over a sixteen-fold a Michigan criterion on the presence of toxic substances at levels which are or may become injurious to the public health, safety, or welfare. Benzene levels in Little Bear Creek exceed U.S. EPA ambient water quality criteria for carcinogenic protection of ingestion of water and organisms by nearly forty-fold. Such conditions are not protective of human health and the environment. Consequently, the No-Action alternative is not appropriate for this site.

Alternative 2 - Extraction, Organic Contaminant Removal, Adsorption, Biological Treatment, Stream Discharge

This alternative utilizes a ground water pumping and treatment scenario, and then discharge into Little Bear Creek for interception of the contaminant plume.

Back in the days of Ott Chemical operation, purge wells and some water supply wells had to be abandoned (or suffered greatly curtailed pumping capacity) due to fouling. Such fouling may have been caused by the pollutants in the groundwater. However, it is now felt that establishing a regularly - scheduled program of well maintenance and downtime would help to avoid such problems. The extraction wells envisioned by this alternative would presumably be of 8''-10'' diameter.

Moreover, if a well was inoperable during maintenance, the remaining wells could be pumped at higher rates to try to extend their zones of coverage.

Alternative 3 - Slurry Wall; Extraction, Organic Contaminant Removal, Adsorption, Biological Treatment, Stream Discharge

From strictly engineering terms, this alternative has certain advantages over Alternative 2. Although initial capital cost is slightly higher, volume of water to be treated is substantially reduced. This results in lower maintenance costs through reduced power demands and dosage requirements. Solid waste handling costs would also be lower, due to reduced spent carbon and sludge generation.

However, Alternative 3 also has drawbacks. In arranging access, it is easier to secure a few well installation points as opposed to a continuous strip of land some 1000' long. Moreover, most of this strip of land would be behind residential properly along Central Road. Possible air emissions may be created in excavating for the slurry wall. Given that one would be working in a zone

Also, the slurry wall integrity once in place, may have some cause for concern. Given the complex nature of the overall contaminant blend in the groundwater, the materials in the groundwater could pose some possibility of attack or breakthrough of the slurry wall.

Alternatives 4 and 5 - Extraction (or) Slurry Wall and Extraction, Organic Contaminant Removal, Adsorption, POTW Discharge.

Compared to Alternatives 2 and 3, both of these alternatives offer significant capital cost savings, since it is assumed that biological treatment can be provided by the POTW and not built in to the alternative.

However, Alternatives 4 and 5 both pose drawbacks as well. As RI fieldwork was proceeding in 1988, local newspapers carried accounts of by-passing of the Muskegon County POTW. Moreover, it is proposed that this POTW undergo a large expansion of nearly 10 mgd. However, the Muskegon County Wastewater Division is not receptive to dedicating any of this planned expansion to accept flows from the Ott/Story/Cordova site. Instead, separate financial commitment for additional capacity may be required before this remedy can be implemented.

Alternative 6 - Trench/French Drain, Stream Discharge

As initially proposed to U.S. EPA by the PRP, this alternative would not have met ARARs because it had no provision for treatment of water collected. In terms of implementability, this alternative poses access problems as noted in the Alternative 3 discussion above. Extensive excavation in soils in which the groundwater is highly contaminated may pose an air emissions problem for nearby residents. If excavated soils are highly contaminated a considerable solid waste management issue is posed.

Maintenance of the trench so as to promote continued high rates of infiltration over time are not explored by the stated alternative. It can be theorized that biological fouling of the trench may be possible. If so, the rate of infiltration into the trench would be reduced. If infiltration rates were reduced sufficiently, the trench would not serve as an effective means of intercepting contaminated groundwater, and pollution of Little Bear Creek would resume. Furthermore, underdrain installation would result in bypass of a portion of the existing stream bed, resulting in possible greater disturbance to natural habitat.

APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS FOR THE OTT/STORY/CORDOVA SITE

CERCLA Section 121 requires that remedial actions comply with the requirements of all Federal and duly established State environmental regulations. Those pertinent regulations are referred to as Applicable or Relevant and Appropriate Requirements (ARARs).

Applicable requirements mean those cleanup standards, standards of control, and other substantive environmental protection standards, requirements, criteria, or limitations promulgated under Federal and State law that specifically address a hazardous substance, pollutant, contaminant, remedial action, location, or other circumstances at a CERCLA site. Applicable requirements are specific to the conditions present on the site for which all of the jurisdictional prerequisites of the law are satisfied.

Relevant and appropriate requirements are those cleanup standards promulgated under Federal and State regulation, that, while not "applicable", address problems or situations sufficiently similar to those encountered at the CERCLA site that their use is well suited to the particular site. A requirement that is judged to be relevant and appropriate receives the same degree of compliance as if it were applicable.

To-be-considered (TBC) materials are non-promulgated advisories or guidance issued by Federal or State government that are not legally binding and do not have the status of ARARs. However, in many circumstances TBCs will be considered along with ARARs as part of the site risk assessment and may be used in determing the necessary level of cleanup for protection of human health for the environment.

ARARs apply to actions or conditions located onsite and offsite. Onsite actions implemented under CERCLA are exempted from having to meet administrative requirements of Federal and State regulations such as permits as long as the substantive requirements of the ARARs are met. Offsite actions are subject to the full requirements of the applicable standards or regulations, including all administrative and procedural requirements.

CHEMICAL-SPECIFIC ARARs

Chemical-specific ARARs include those laws and regulations governing the release of materials possessing certain chemical or physical characteristics, or containing specified chemical compounds. These requirements generally set health or risk-based concentration limits or discharge limitations in various environmental media for specific hazardous substances. Examples include drinking water standards, and ambient air quality standards.

LOCATION-SPECIFIC ARARs

Location-specific ARARs are design requirements or activity restrictions based on the geographical or physical position of the site and its surrounding area. Examples include areas in a flood plain, a wetland, or a historic site.

ACTION-SPECIFIC ARARs

Action-specific ARARs are technology-based and establish performance, design, or other similar action-specific controls or regulations on activities related to the management of hazardous substances or pollutants. An example includes RCRA incineration regulations.

The charts following on pages 19 - 24 summarize ARARs for this site. The charts following on pages 25 to 29 list TBC's for this site.

CHEMICAL SPECIFIC ARARS

Standard, Requirement, Criteria, or Limitation	Citation	Description	Applicable/ Relevant and Appropriate	Comment
FEDERAL:				
Safe Drinking Water Act	40 U.S.C. Sect. 300			
National Primary Drinking Water Standards	40 C.F.R. Part 141	Establishes health-based standards for public water systems (maximum contaminant levels).	No/Yes	The MCLs for organic and inorganic contaminants are relevant and appropriate for water at the site since it is a potential drinking water source.
National Secondary Drinking Water Standards	40 C.F.R. Part 143	Establishes welfare-base standards for public water systems (secondary maximum contaminant levels).	No/No	The secondary MCLs for inorganic contaminants in ground water are "to-be-considered" guidelines.
Maximum Contaminant Level Goals	Pub. L. No. 99-339 100 Stat. 642 (1986)	Establishes drinking water quality goals set at levels of no known or anticipated adverse health effect.	No/No	Proposed MCLGs for organic and and inorganic contaminants may be relevant and appropriate for ground water potentially used for drinking water.
Clean Water Act	33 U.S.C. Sect. 1251-1376			
Water Quality Criteria	40 C.F.R. Part 131	Sets criteria for water quality based on toxicity to aquatic organisms and human health.	No/Yes	The AWQC for organic and inorganic contaminants are relevant and appropriate.

CHEMICAL SPECIFIC ARARS (CONTINUED)

Standard, Requirement, Criteria, or Limitation	Citation	Description	Applicable/ Relevant and Appropriate	Comment
STATE:				
Michigan Water Resources Commission Act				
Water Quality Standard	R323.1055	Establishes water quality requirements applicable to all surface waters of Michigan which protect public health and environment.	Yes/No	Guidelines for allowable levels of toxic organic and inorganic compounds in surface water after a discharge is mixed with a receiving stream.
Act 245	Part 4 Rule 55	Regulates taste and odor producing substances	No/Yes	Citizen complaint of odor from Little Bear Creek
	Rule 57	Prohibits within waters of the state toxic substances at specific levels injurious to various water uses	Yes/No	Various pollutants in Little Bear Creek found in excess of levels in Rule due to influx of contaminated groundwater
	Rule 82	Defines mixing zones	No/Yes	Relevant to consider in receiving stream below effluent
	Rule 90	Specifies water quality standards	Yes/No	
	Rule 96	Specifies compliance with water quality standards	Yes/No	

LOCATION-SPECIFIC ARARS

Standard, Requirement, Criteria, or Limitation	Citation	Description	Applicable/ Relevant and Appropriate	Comment
FEDERAL:				
Resource Conservation and Recovery Act (as amended)	42 U.S.C. 6901			
Location Standards	40 C.F.R. 264.18(b)	A TSD facility must be designed, constructed, operated, and maintained to avoid washout.	No/Yes	Potential remedies alternatives within the 100-year floodplain. Requirement is relevant and appropriate.
Fish and Wildlife Coordination Act	16 U.S.C. 661-666			
Floodplain Management Executive Order	Executive Order 11988 40 C.F.R. 6.302	Actions that are to occur in floodplain should avoid adverse effects, minimize potential harm, restore and preserve natural and beneficial value.	Yes/No	Remedial actions are to prevent incursion of contaminated ground water onto forested floodplain.
Wetlands Protection	Executive Order 11990 40 C.F.R. 6, Appendix A	Requires that EPA conduct activities to avoid, to the extent possible, the long- and short-term adverse impacts associated with the destruction or modification of wetlands.	Yes/No	Remedial actions to impact site, directly by stopping incursion of contaminated ground water into wetlands area associated with Little Bear Creek.

LOCATION-SPECIFIC ARARS (CONTINUED)

Standard, Requirement, Criteria, or Limitation	Citation	Description	Applicable/ Relevant and Appropriate	Comment
STATE				
Wetland Protection Act	Act 203, R281.701	Provides for preservation, management, protection, and use of wetlands by prohibiting certain activities, requiring a permit to alter wetlands, and imposing penalties and fees for violation of the act.	Yes/No	Remedial actions to impact site directly by stopping incursion of contaminated groundwater into wetlands area associated with Little Bear Creek.
Endangered Species Act	Act 203, R299.1021-R299.1028	Provides for protection of endangered or threatened fish, wildlife, and plant species.	No/No	No State endangered or threatened species were identified in or near site.
Thomas J. Anderson, Gordon Rockwell Environmental Protection Act	Act 127.P.A. 1970	Act is to protect air, water, and other resources and the public trust in State from pollution, impairment, and destruction.	Yes/No	Act directly applicable to environmental degradation found at the site.
Water Resources Act	323.6 Sec. 6(a)	Unlawful to discharge to waters of State injurious substances	Yes/No	Compliance with this ARAR demonstrates via compliance with Act 245, Part 21
Water Resources Act	Act 245, Part 21	Establishes NPDES discharge standards for effluent to streams	No/Yes	Compliance with tecnical requirements of this Part necessary; not for administrative conditions for onsite remedial action
Soil/Sedimentation Control Act	Act 347	Plan to control erosion within 500 feet of lake or stream	No/Yes	(Same as above)
Inland Lakes/Streams Act	Act 346	Involves acts which construct, remove, or place structures on bottomland	No/Yes	(Same as above)
Air Pollution Act	Act 348	Involves sources of air contaminants	No/Yes	(Same as above)

OTT/STORY/CORDOVA
SUMMARY OF GROUND WATER FINDINGS and ARARs
(ug/l, ppb)

Compound	Maximum Concentration Detected	Drinking Water Standard Maximum Contaminant Level MCL	Excess Lifetime Cancer Risk - 10^{-6} Exposure From Ingestion Residential Exposure	Non-Carcinogenic Risk Reference Dose Concentration Highest Risk Age Group, 0-6 Yrs
Volatile Organics				
Acetone	1600	-	-	1000
Benzene	3800	5	1.2	-
Chlorobenzene	110	-	-	270
Chloroethane	34	-	-	-
1,1-dichloroethene	7900	7	0.06	-
1,1-dichloroethane	6300	-	-	1200
1,2-dichloroethane	110000	5	0.4	-
1,2-dichloroethene (total)	140	-	-	-
Methylene Chloride	2300	-	4.7	-
Toluene	38000	-	-	3000
Trichloroethene	110	5	3.2	-
Vinyl Chloride	130000	2	0.02	-
Semi-Volatile Organics				
Aniline	6000	-	-	-
Bis(2-ethylhexyl)phthalate	91	-	51	-
Benzoic Acid	47000	-	-	-
Benzyl Alcohol	3000	-	-	-
Butyl Benzyl phthalate	2	-	-	-
4-Chloroaniline	1200	-	-	-
2-Chlorophenol	2100	-	-	-
4-Methylphenol	1200	-	-	-
N-Nitrosodiphenylamine	19	-	7.1	-

OTT/STORY/CORDOVA
SUMMARY OF GROUND WATER FINDINGS and ARARs
(ug/1, ppb)

Compound	Maximum Concentration Detected	Drinking Water Standard Maximum Contaminant Level MCL	Excess Lifetime Cancer Risk - 10^{-6} Exposure From Ingestion Residential Exposure	Non-Carcinogenic Risk Reference Dose Concentration Highest Risk Age Group, 0-6 Yrs
Pesticides				
Heptachlor Expoxide	0.49	-	0.004	-
4,4-DDD	0.13	-	-	-
Inorganics				
Arsenic	92	50	0.02	-
Barium	1680	1000	-	500
Copper	119	-	-	370
Chromium	7.8	50	-	50
Lead	101	50	-	14
Selenium	2.4	10	-	30
Silver	1070	50	-	30
Zinc	2230	-	-	2100
Cyanide	616			200

TO-BE-CONSIDERED (TBC) MATERIALS
PROPOSED NATIONAL PRIMARY DRINKING WATER REGULATIONS

Contaminants	Drinking Water Health Effects	Proposed MCLG (mg/L)	Current MCL (mg/L)	Proposed MCL (mg/L)	Sources	Analytical Methods[2]	BAT[3]
INORGANICS							
Asbestos	Benign tumors	7 million fibers/liter	-	7 million fibers/liter	Geological, asbestos cement pipe	TEM	C/F;DF; DMF;CC
Barium	Circulatory system effects	5	1	5	Geological	GFAA; DAAA;ICP	IE;LS; RO
Cadmium	Kidney effects	0.005	0.01	0.005	Geological, mining and smelting	GFAA; ICP	IE;RO; C/F;LS
Chromium	Gastrointestinal effects	0.1	0.05	0.1	Geological	GFAA; DAAA;ICP	C/F;IE; LS;RO
Mercury	Kidney effects	0.002	0.002	0.002	Used in manufacture of paint, paper, vinyl chloride; used in fungicides; geological	MCV;ACV	GAC;LS C/F;RO; PAC
Nitrate	Methemoglobinemia ("blue baby" syndrome)	10	10	10	Fertilizer, sewage, feedlots	MCR;IC;ISE ACR;AHR	IE;RO
Nitrate	Methemoglobinemia ("blue baby" syndrome)	1	-	1	Fertilizer, sewage, feedlots	SP;IC ACR;MCR	IE;RO
Selenium	Neurological effects	0.05	0.01	0.05	Geological, mining	GFAA;GHAA	AA;LS, C/F;RO
VOLATILE ORGANICS(Solvents)							
cis-1,2-Dichloroethylene	Nervous system, liver, kidney	0.07	-	0.07	Extraction solvent, dyes, perfumes, pharmaceuticals, lacquers	502.1;502.2; 503.1;524.1;524.2	PTA;GAC

TO-BE-CONSIDERED (TBC) MATERIALS
PROPOSED NATIONAL PRIMARY DRINKING WATER REGULATIONS (CONTINUED)

Contaminants	Drinking Water Health Effects	Proposed MCLG (mg/L)	Current MCL (mg/L)	Proposed MCL (mg/L)	Sources	Analytical Methods[2]	BAT[3]
INORGANICS							
1,2-Dichloropropane	Liver toxin, lung and kidney effects	0	-	0.005	Pesticide, solvent	(Analytical Methods and BAT are the same for all volatile organics)	
Ethylbenzene	Liver, kidney effects	0.7	-	0.7	Manufacture of styrene		
Monochlorobenzene	Respiratory, nervous system, liver, kidney effects	0.1	-	0.1	Solvent, pesticide		
O-Dichlorobenzene	Nervous system, lung, liver, kidney effects	0.6	-	0.6	Industrial solvent, pesticide		
Styrene	Possible cancer, liver, central nervous system effects	0/0.1[1]	-	0.005/0.1[1]	Manufacture of polystyrene plastic		
Tetrachloroethylene	Probable cancer	0	-	0.005	Dry cleaning solvent		
Toluene	Nervous system, lung, liver effects	2	-	2	Solvent, gasoline additive		
trans-1,2-Dichloroethylene	Nervous system, liver, kidney effects	0.1	-	0.1	Extraction solvent, dyes, perfumes, pharmaceuticals, lacquers		
Xylenes	Central nervous system effects	10	-	10	Solvent; used to manufacture paints, dyes, adhesives, detergents; fuel additive		

TO-BE-CONSIDERED (TBC) MATERIALS
PROPOSED NATIONAL PRIMARY DRINKING WATER REGULATIONS (CONTINUED)

Contaminants	Drinking Water Health Effects	Proposed MCLG (mg/L)	Current MCL (mg/L)	Proposed MCL (mg/L)	Sources	Analytical Methods^2	BAT^3
PESTICIDES/HERBICIDES/PCBs							
Alachlor	Probable cancer	0	-	0.002	Herbicide	505;507	GAC
Aldicarb	Nervous system toxicity	0.01	-	0.01	Pesticide, herbicide, restricted in some areas	531.1	GAC
Aldicarb sulfoxide	Nervous system toxicity	0.01	-	0.01	Pesticide, herbicide, restricted in some areas	531.1	GAC
Aldicarb sulfone	Nervous system toxicity	0.04	-	0.04	Pesticide, herbicide, restricted in some areas	531.1	GAC
Atrazine	Nervous system, liver, heart effects	0.003	-	0.003	Herbicide	505;507	GAC
Carbofuran	Nervous system, reproductive effects	0.04	-	0.04	Pesticide, herbicide	531.1	GAC
Chlordane	Nervous system, liver effects	0	-	0.02	Pesticide, herbicide, most uses banned in 1980	505;508	GAC
INORGANICS							
Dibromochloropropane (DBCP)	Probable cancer	0	-	0.0002	Pesticide, cancelled in 1977	504	GAC
2,4-D	Liver, kidney effects	0.07	0.1	0.07	Herbicide	515.1	GAC
Ethylene dibromide	Probable cancer	0	-	0.00005	Gasoline additive soil fumigant, solvent, most pesticide uses restricted in 1984	504	GAC

TO-BE-CONSIDERED (TBC) MATERIALS
PROPOSED NATIONAL PRIMARY DRINKING WATER REGULATIONS (CONTINUED)

Contaminants	Drinking Water Health Effects	Proposed MCLG (mg/L)	Current MCL (mg/L)	Proposed MCL (mg/L)	Sources	Analytical Methods[2]	BAT[3]
Heptachlor	Probable cancer	0	-	0.0004	Insecticide, most uses restricted in 1983	505;508	GAC
Heptachlor epoxide	Probable cancer	0	-	0.0002	Insecticide, most uses restricted in 1983	505;508	GAC
Lindane	Neurological, liver, kidney effects	0.0002	0.004	0.0002	Insecticide to control fleas, lice, ticks, some uses restricted in 1983	505;508	GAC
Methoxychlor	Central nervous system effects	0.4	0.1	0.4	Insecticide	505;508	GAC
PCBs	Probable cancer, reproductive effects	0	-	0.0005	Very persistent, transformers, capacitors; production banned in 1977	505; 508(screen only); 508A	GAC
Pentachlorophenol	Organ central nervous system, fetal effects	0.2	-	0.2	Wood preservative; non-wood uses banned in 1987	515.1	GAC
Toxaphene	Probable cancer	0	0.005	0.005	Pesticide, herbicide, most use cancelled in 1977	505	GAC
2,4,5-TP (Silvex)	Liver, kidney effects	0.05	0.01	0.05	Herbicide, cancelled in 1983	515.1	GAC
DRINKING WATER TREATMENT CHEMICALS							
Acrylamide	Probable cancer	0	-	Treatment technique[4]	Drinking water treatment	NA	PAP
Epichlorohydrin	Probable cancer	0	-	Treatment technique[4]	Drinking water treatment	NA	PAP

[1] EPA proposes a dual MCLG/MCL for styrene. After public comment, a single MCLG and MCL will be set.

[2] Analytical Methods key:

TEM -Transmission Electron Microscopy
GFAA -Graphite Furnace Atomic Absorption
DAAA -Direct Aspiration Atomic Absorption
ICP -Inductively Coupled Plasma
MCV -Manual Cold Vapor
ACV -Automated Cold Vapor
GHAA -Gaseous Hydride Atomic Absorption
MCR -Manual Cadmium Reduction
ACR -Automated Cadmium Reduction
AHR -Automated Hydrazine Reduction
ISE -Ion Selective Electrode
IC -Ion Chromatography
SP -Spectrophotmetric

Analytical Methods Numbers to EPA methods

[3] Best Available Technology (BAT) key:

AA -Activated Alumina
C/F -Coagulation/Filtration
CC -Corrosion Control
DF -Direct Filtration
DMF -Diatomite Filtration
PAC -Powered Activated Carbon
GAC -Granular Activated Carbon
IE -Ion Exchange
LS -Lime Softening
RO -Reverse Osmosis
PTA -Packed Tower Aeration
PAP -Polymer Addition Practices

[4] Treatment technique requirement limits the amount of the chemical which is used to treat drinking water.

COMPARATIVE ANALYSIS OF ALTERNATIVES

CRITERION:
1. OVERALL PROTECTION OF HUMAN HEALTH AND THE ENVIRONMENT

Alternative 1	As we have seen, signs warning of contaminated water have been placed in Little Bear Creek. A risk has also been identified with air inhalation at points within the stream's valley, and a chloroform level in Little Bear Creek exceeded the appropriate ambient water criterion by a factor of nearly two-fold. Additionally, levels of benzene, vinyl chloride, and 1,2-dichloroethane exceed drinking water criteria within Little Bear Creek. Vinyl chloride levels also exceed by over a sixteen-fold a Michigan criterion on the presence of toxic substances at levels which are or may become injurious to the public health, safety, or welfare. Benzene levels in Little Bear Creek exceed U.S. EPA ambient water quality criteria for carcinogenic protection of ingestion of water and organisms by nearly forty-fold. Such conditions are not protective of human health and the environment. Consequently, the No-Action alternative is not appropriate for this site.
Alternative 2 (Groundwater Extraction, Oorganics Pretreatment, Filtration, Biological Treatment, Stream Dishcarge)	This alternative will prevent contaminated discharge from entering the Little Bear Creek system to the extent necessary to adequately protect human health and the environment.
Alternative 3 (Slurry wall with Groundwater Extraction Filtration, Biological Treatment, Stream Discharge)	This alternative will prevent contaminated groundwater discharge from entering the Little Bear Creek system to the extent necessary to adequately protect human health and the environment.
Alternative 4 (Groundwater Extraction, Organics Pretreatment, Filtration, POTW Discharge)	This alternative will prevent contaminated groundwater discharge from entering the Little Bear Creek system to the extent necessary to adequately protect human health and the environment.
Alternative 5 (Slurry wall with Groundwater Extraction, Organics Pretreatment, Filtration, POTW	This alternative will prevent contaminated groundwater discharge from entering the Little Bear Creek system to the extent necessary to adequately protect human health and the environment.

Alternative 6 (Trench Intercept, No Treatment, POTW Discharge)	This alternative will prevent contaminated groundwater discharge from entering the Little Bear Creek system to the extent necessary to adequately protect human health and the environment.

2. COMPLIANCE WITH ARARs

Alternative 1	Alternative 1 will not comply with federal/state ARARs.
Alternative 2	This alternative complies with federal/state ARARs.
Alternative 3	This alternative complies with federal/state ARARs.
Alternative 4	This alternative complies with federal/state ARARs, if no bypass condition occurs.
Alternative 5	This alternative complies with federal/state ARARs, if no bypass condition occurs.
Alternative 6	Alternative 6 does not comply with federal/state treatment ARARs as originally proposed. For comparison purposes, U.S. EPA assumed treatment was performed. Alternative 6 may not meet requirement for protection of wetlands and floodplains.

3. LONG-TERM EFFECTIVENESS AND PERMANENCE

Alternative 1	Taking no action will result in significant risk remaining from contaminated groundwater entering the stream and posing problems of surface water contact and air inhalation.
Alternative 2	It is expected that several years of groundwater extraction and treatment may leave residual contamination in groundwater. Dealing with such residuals will be an objective of the full site feasibility study.
Alternative 3	Same as Alternative 2, however, the complex nature of the groundwater contaminants may pose a long-term threat to impermeable nature of slurry wall.

Alternative 4

Same as Alternative 2; however, potential for POTW bypass exists.

Alternative 5

Same as Alternative 3; however, potential for POTW bypass exists.

Alternative 6

Same as Alternative 2, but potential loss of underdrain permeability due to biological growths over time and lack of containment of contaminated groundwater exists. Greater disruption of habitat in stream floodplain is also possible.

Maintenance of the trench so as to promote continued high rates of infiltration over time are not explored by the stated alternative. It can be theorized that biological fouling of the trench may be possible. If so, the rate of infiltration into the trench will be reduced. If infiltration rates were reduced sufficiently, the trench would not serve as an effective means of intercepting contaminated groundwater, and pollution of Little Bear Creek would resume.

4. REDUCTION OF TOXICITY, MOBILITY OR VOLUME THROUGH TREATMENT

Alternative 1

No hazardous materials would be treated.

Alternative 2

Approximately 210 million gallons per year of contaminated groundwater would be extracted and treated, and up to 165,000 pounds of total organic contaminants would be removed from groundwater over a year's time. Approximately 400-500 tons per year of residual solids from filtration/wastewater treatment may be created.

Alternative 3

Approximately 79 million gallons per year of contaminated groundwater would be extracted and treated, and up to 80,000 pounds of total organic contaminants would be removed from groundwater over a year's time. Some 200-300 tons per year of residual solids from filtration/wastewater treatment may be created.

Alternative 4

Same as Alternative 2, above.

Alternative 5

Same as Alternative 3, above.

Alternative 6

Approximately 210 million gallons of groundwater would be extracted and treated per year.

5. SHORT-TERM EFFECTIVENESS

Alternative 1

If no action is taken, significant risk will remain from contaminated groundwater entering the stream and posing problems of surface water degradation, resource impairment, and air inhalation.

Alternative 2

Alternative 2 would take about 18-20 months for installation completion. Construction is expected to result in some minimal disturbance to the community. A program of health and safety training and usage of protective gear is expected for workers. Environmental impacts are expected to be slight; dust control measures would likely be necessary, contaminated soil cuttings would be disposed according to RCRA. Groundwater extraction may result in reduced stream flow, notably in the unnamed tributary.

Alternative 3

Alternative 3 would take about 19-21 months for installation completion. Usage of a slurry wall will increase disturbance to the community due to increased volatile air emissions during excavation. Temporary residential relocation may be required. More disturbance to vegetation/ potential habitat is likely due to slurry wall excavation. Such excavation would also present further health/safety factors for which workers must be made aware. On the other hand, employment of a slurry wall could likely reduce sludges created by wastewater treatment.

However, Alternative 3 also has drawbacks. In arranging access, it is easier to secure a few well installation points as opposed to a continuous strip of land some 1000' long. Moreover, most of this strip of land would be behind residential properly along Central Road. Possible air emissions may be created in excavating for the slurry wall. Given that one would be working in a zone of contaminated soils and groundwater, one should consider the possible effects on nearby residents as well as workers. Air emissions from well boreholes would appear to pose less of a problem to residents.

Alternative 4

Alternative 4 would take about 16-18 months for installation completion. Other short-term effectiveness features are as in Alternative 2, above.

Alternative 5

Alternative 5 would take about 18-20 months for installation completion. Other short-term effectiveness features are as in Alternative 3, above.

Alternative 6

Same as Alternative 3, but habitat disturbance would be more pronounced and no reduction in residuals generated would occur.

6. IMPLEMENTABILITY

Alternative 1

Not applicable to a no-action alternative

Alternative 2

The groundwater extraction and treatment facilities are readily constructed. While pilot testing is likely needed to yield best performance, implementation of this alternative would not make any future remedial actions significantly more difficult to undertake. Monitoring effectiveness can be done through groundwater - surface water sampling and analysis; biological monitoring may be needed to help judge performance and stream recovery. One type of pretreatment for organics that could be utilized is somewhat innovative; (i.e. ultraviolet oxidation) all other technologies envisioned are conventional. This will require access arrangements for piping, as will all other Alternatives except Alternative 1.

Back in the days of Ott Chemical operation, some water supply and purge wells had to be abandoned or suffered greatly curtailed pumping capacity due to fouling. Such fouling may have been caused by the pollutants in the groundwater. However, establishing a regularly - scheduled program of well maintenance and downtime would help to avoid such problems. The extraction wells envisioned by this alternative would presumably be of 8''-10'' diameter.

Moreover, if a well became inoperable during maintenance, the remaining wells could be pumped harder to try to extend their zones of coverage.

Alternative 3

Alternative 3 presents much the same components of implementability as Alternative 2. However, usage of a slurry wall would pose a more difficult construction task than Alternative 2, and arranging access for a 1000' continuous strip of land would be more difficult.

Also, slurry wall integrity, once in place, becomes an issue. Given the complex nature of the overall contaminant blend in the groundwater, the materials in the groundwater could pose some possibility of attack or breakthrough of the slurry wall.

Alternative 4

Alternative 4 presents much the same components of implementability as Alternative 2. However, physical checking of pipeline integrity would need to be enhanced. Also, institutional considerations may play a role in implementability. Negotiation over capital share with the POTW would prove necessary.

However, Alternatives 4 and 5 both pose drawbacks as well. As RI fieldwork was proceeding in 1988, local newspapers carried accounts of by-passing of the Muskegon County POTW. Moreover, it is proposed that this POTW undergo a large expansion of nearly 10 mgd. However, the Muskegon County Wastewater Division is not receptive to dedicating any of this planned expansion to accept flows from the Ott/Story/Cordova site. Instead, separate financial commitment for additional capacity may be required before this remedy can be implemented.

Alternative 5

Alternative 5 presents much the some component of implementability as Alternative 3 and 4 combined.

Alternative 6

Same as Alternative 3; however the need to provide for trench dewatering during construction adds a further factor.

7. COST

(NOTE - Cost estimates are order-of-magnitude level with an expected accuracy of plus 50 percent to minus 30 percent. All estimates and present worth calculations are rounded to no more than three significant figures.)

Alternative 1

Capital Costs	$0
Operation/Maintenance (over 5 years)	$0
Total Present Worth	$0

Alternative 2	Capital Costs	$ 5,030,000
	Operation/Maintenance	$ 7,000,000
	Total Present Worth	$11,700,000
Alternative 3	Capital Costs	$5,620,000
	Operation/Maintenance	$4,090,000
	Total Present Worth	$9,500,000
Alternative 4	Capital Costs	$3,140,000
	Operation/Maintenance	$2,082,000
	Total Present Worth	$8,840,000
Alternative 5	Capital Costs	$3,600,000
	Operation/Maintenance	$3,750,000
	Total Present Worth	$7,380,000
Alternative 6	Capital Costs	$ 5,500,000
	Operation/Maintenance	$ 7,700,000
	Total Present Worth	$12,200,000

STATE ACCEPTANCE and COMMUNITY ACCEPTANCE

The MDNR has expressed concern to U.S. EPA over the "severe surface water degradation" in Little Bear Creek "below the point where the contaminated groundwater enters the stream." MDNR has urged U.S. EPA to act "as quickly as possible" to stop the contamination from this site from entering the Little Bear Creek system. To the best of U.S. EPA's knowledge and belief, Michigan favors Alternative 2.

At the August 16, 1989 public meeting, no area resident expressed disapproval of action to control surface water contamination. Several residents commented that U.S. EPA should move aggressively not only on this aspect, but also on the issue of remediation of contaminated soils.

These criteria will be considered in more detail in the responsiveness summary commentary of this report.

9. THE SELECTED REMEDY

Based upon consideration of the requirements of CERCIA, the detailed evaluation of the alternatives, and public comments, both EPA and the State of Michigan have determined that Alternative 2 (Groundwater Extraction, Organics Removal, Filtration, Biological Treatment, Stream Dishcarge) is the most appropriate remedy (first operable unit) for the Ott/Story/Cordova Site in North Muskegon, Michigan.

A series of extraction wells in the vicinity of Little Bear Creek and its unnamed tributary will intercept approximately four hundred gallons per minuate of contaminated groundwater from entering these surface water bodies prior to treatment. Contaminants in the groundwater will be addressed through first removing organics by physical - chemical means, employing filtration for subsequent organic contaminant, suspended solids, and color removal, and then utilizing biological treatment to bring about further reduction in degradable organics. Waters thus treated will then be discharged into Little Bear Creek, or the North Branch of the Muskegon River. Effluent quality will be dictated by values as established by the NPDES program administered by the Michigan Department of Natural Resources. As a result of engineering undertaken in the Remedial Design and construction process, some changes may occur in certain remedy elements.

RESPONSE OBJECTIVES

The response objectives for this operable unit are to intercept and contain contaminated groundwater within the unconfined groundwater system, eliminate potential surface water and air exposure routes by preventing contaminated groundwater discharge into Little Bear Creek and its unnamed tributary, and to ensure that this operable unit is fundamentally compatible with future remedial actions at the Ott/Story/Cordova site. In determining an acceptable stream effluent, the applicable or relevant and appropriate requirement (ARARs) of environmental laws were reviewed. These values are presented on page 41 in this text as "Michigan Limits on Stream Discharge".

The intrusion of contaminated groundwater into Little Bear Creek and its unnamed tributary has resulted in the degradation of portions of those bodies of water. Undertaking the selected remedy will bring about a recovery in stream quality, and will also reduce risk associated with contact with surface water and inhalation of volatile organics.

COST SUMMARY FOR THE SELECTED REMEDY

(i = 5 percent)

COST COMPONENT	YEAR COST INCURRED	CAPITAL COST ($) (TABLE)	ANNUAL O&M ($) (TABLE)	PRESENT WORTH FACTOR	PRESENT WORTH ($)
FOUR EXTRACTION WELLS	0	470,000		1.0000	470,000
	1 thru 5		32,000	4.3295	139,000
UV-OXIDATION	0	1,180,000		1.0000	1,180,000
	1 thru 5			4.3295	1,831,000
CARBON ADSORPTION	0	650,000		1.0000	650,000
	1		233,000	0.9524	222,000
	2		210,000	0.9070	190,000
	3		190,000	0.8638	164,000
	4		171,000	0.8227	141,000
	5		154,000	0.7835	121,000
ACTIVATED SLUDGE **	0	1,190,000		1.0000	1,190,000
	1		187,000	0.9524	178,000
	2		180,000	0.9070	163,000
	3		173,000	0.8638	149,000
	4		167,000	0.8227	137,000
	5		161,000	0.7835	126,000
FILTRATION	0	120,000		1.0000	120,000
	1 thru 5		4,000	4.3295	17,000
STREAM DISCHARGE	0	200,000		1.0000	200,000
	1 thru 5		0	4.3295	0
MISCELLANEOUS	0	1,220,000		1.0000	1,220,000
	1 thru 5		726,000	4.3295	3,143,000
TOTAL CAPITAL COSTS		$5,030,000			
ANNUAL OPERATION & MAINTENANCE		YEAR 1	$1,605,000		
		YEAR 2	$1,575,000		
		YEAR 3	$1,548,000		
		YEAR 4	$1,523,000		
		YEAR 5	$1,500,000		
PRESENT WORTH					$11,751,000

** Costs for activated sludge include the costs associated with residuals management (sludge dewatering and disposal).

10. STATUTORY DETERMINATIONS

PROTECTION OF HUMAN HEALTH AND THE ENVIRONMENT:

Surface water samples collected from Little Bear Creek and its unnamed tributory were found to be contaminated with the compounds whose source was seeps of upwelling ground water. Signs warning of contaminated water have been posted in the stream bed by Muskegon County Health Department upon recommendation of the State of Michigan. Entry of contaminated groundwater into the streams also presents an air inhalation problem, due to the volatile nature of several of the contaminants. Residents near Little Bear Creek and the unnamed tributary are exposed to excess lifetime cancer risks ranging from 1×10^{-6} to 1×10^{-4} for high inhalation exposures, and are being deprived of full usage opportunity of a water resource.

The selected remedy protects human health and the environment through interception of contaminated groundwater in the vicinity of Little Bear Creek and subsequent treatment of organics removal, filtration, and biological treatment. Such treatment will eliminate the major source of hazardous substance contamination of the Little Bear Creek system in the vicinity of the Ott/Story/Cordova site. It is believed that any short-term threats associated with the selected remedy can be readily controlled. Design of the selected remedy will be such that a cross-media problem (e.g. air emissions that could result from volatile contaminants in groundwater) will be controlled.

COST-EFFECTIVENESS:

The selected remedy is cost-effective because it has been determined to provide overall effectiveness proportional to its costs, the net present worth value being $11,750,000. The selected remedy effectively reduces the hazards posed by the site contaminants. The cost-efficiency of the selected remedy will be furthered by engineering conducted during remedial design. While apparent costs of POTW discharge options are less than the selected remedy, the selected remedy avoids the uncertainty of POTW capacity and related capital assessments for this site, as well as the future user fee and bypass questions.

COMPLIANCE WITH APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS (ARARs)

The selected remedy of groundwater extraction, organics removal, filtration, biological treatment, and stream discharge will attain all ARARs pertinent to effluent discharges and stream standards. This operable unit does not address the final remediation of groundwater restoration, which will be addressed as site remediation proceeds through the RI/FS process. ARARs pertaining to groundwater restoration are not addressed in this operable unit, but will be considered in the overall site Feasibility Study. Key ARARs for this project are effluent and stream quality limitations provided by the State of Michigan. These are given below:

MICHIGAN LIMITS ON STREAM DISCHARGE (Act 245, Part 21; Rule 57)

WQBELS for parameters to be treated and discharged from the Ott/Story/Cordova Chemical Company site, Muskegon County, Michigan NPDES Permit #MI0048145 - Proposed alternative discharge sites located on Little Bear Creek or N. Channel Muskegon River at discharge rates of either 0.57 or 2.47 MGD.

PARAMETERS	ESTIMATED GROUNDWATER CONCENTRATION (ug/l)	BAT* LIMITS (ug/l)	ACUTE VALUES (ug/l)	RULE 57(2) VALUES (ug/l)	Comment*	WATER QUALITY BASED EFFLUENT LIMITS (30-DAY AVERAGE LIMITS) OPTION* 1 (ug/l)	OPTION* 2 (ug/l)	OPTION* 3 (ug/l)	OPTION* 4 (ug/l)
vinyl chloride **	12000	3		3.1	TLSC	BAT	BAT	BAT	BAT
1,1-dichlorethane	1700		INSUFFICIENT INFORMATION						
1,1-dichloroethene **	250	2	3000	2.6	CRV	BAT	BAT	BAT	BAT
benzene **	350	5	5300	60	TLSC	BAT	BAT	BAT	BAT
toluene	800	5	4800	100	ACV	225	129	10327	2450
chloroform **	500		3600	43	CRV	BAT	BAT	BAT	BAT
methylene chloride **	500		2640	59	ACV	BAT	BAT	BAT	BAT
1,2-dichloroethane **	250000	10	12700	560	CRV	1260	721	BAT	BAT
chloroebenzene	50		3200	71	ACV	160	91	7332	1739
MIBK (4-aethyl,2-hexanone)	50		52000	1155	ACV	2599	1487	119280	28296
acetone (2-propanone)	600			500	TLSC	1125	644	51636	12249
benzyl alcohol	200		2000	44	ACV	99	57	4544	1078
O-cresol (4-methyl phenol)	50		140	3	ACV	7	4	310	73
2-chlorophenol	50		440	10	ACV	22	13	1033	245
n-methyl aniline	4500		INSUFFICIENT INFORMATION						
2-ethyl aniline	2000		1234	27	ACV	61	35	2789	661
4-chloroaniline	300		240	5	ACV	11	6	516	122
tetraethyl urea	50			533	ACV	1199	928	27788	13059
camphor	2500		7200	60	ACV	135	77	6196	1471
benzoic acid	300		9368	208	ACV	468	268	21481	5096
tetrahydrofuran	200		5000	11	ACV	25	14	1136	269
bis (2-ethylhexyl) phthalate **	50		4520	100	ACV	BAT	BAT	BAT	BAT

MICHIGAN LIMITS ON STREAM DISCHARGE (Act 245, Part 21; Rule 57)

PARAMETERS	ESTIMATED GROUNDWATER CONCENTRATION (ug/l)	BAT* LIMITS (ug/l)	ACUTE VALUES (ug/l)	RULE 57(2) VALUES (ug/l)	Comment*	OPTION* 1 (ug/l)	(30-DAY AVERAGE LIMITS) OPTION* 2 (ug/l)	OPTION* 3 (ug/l)	OPTION* 4 (ug/l)
arsenic	30			184		241	197	4863	1259
cadmium				0.7		0.9	0.7	18	4.7
chromium				93		121	99	2435	631
copper	60			40		51	42	977	255
cyanide A				4		5	4	106	27
lead	20			10		11	10	130	37
nickel	20			148		191	157	3666	956
.selenium				22		29	24	585	151
zinc	1500			177		229	189	4435	1155

* Option 1 = 0.57 MGD discharge to Little Bear Creek with a 95% exceedance flow of 1.1 cfs.
Option 2 = 2.47 MGD discharge to Little Bear Creek with a 95% exceedance flow of 1.1 cfs.
Option 3 = 0.57 MGD discharge to N. Channel of the Muskegon River with a 95% exceedance flow of 360 cfs.
Option 4 = 2.47 MGD discharge to N. Channel of the Muskegon River with a 95% exceedance flow of 360 cfs.

BAT = BEST AVAILABLE TREATMENT
CRV = CANCER RISK VALUE
ACV = AQUATIC CHRONIC VALUE
TLSC = TERRESTRIAL LIFE CYCLE SAFE VALUE

** CARCINOGEN

UTILIZATION OF PERMANENT SOLUTIONS TO THE MAXIMUM EXTENT PRACTICABLE

U.S. EPA and the State of Michigan have determined that the selected remedy represents the maximum extent to which permanent solutions and treatment technologies can be utilized in a cost-effective manner for the operable unit at the Ott/Story/Cordova site, of those alternatives that are protective of human health and the environment and comply with ARARs. U.S. EPA and the State have determined that this selected remedy provides the best balance of trade offs in terms of long-term effectiveness and performance, reduction in toxicity, mobility, or volume achieved through treatment, short-term effectiveness, implementability, and cost, considering the statutory preference for treatment as a principal element and considering State and community acceptance.

The selected remedy will significantly reduce the hazards now posed by the entry of contaminated groundwaters into Little Bear Creek and its unnamed tributary. The selected remedy will treat this contaminated groundwater through removal of organics and solids such that the resultant effluent can be discharged into Little Bear Creek and meet substantive requirements of the NPDES system as administered by the State of Michigan.

The selected remedy provides for less disruption and requires less time to implement than do options involving a slurry wall or trench.

PREFERENCE FOR TREATMENT AS A PRINCIPAL ELEMENT

By intercepting and treating contaminated groundwater prior to its entry into surface water streams, the selected remedy addresses one of the principal threats posed by the site through the use of treatment technologies.

As noted previously in discussion of Alternative 1 (No-Action), Little Bear Creek fails to meet certain relevant and appropriate water criteria due to the influx of contaminated groundwater originating from the Ott/Story/Cordova site. Elimination of such threat will aid in stream recovery. The treatment process noted in the earlier discussion of Alternative 2 will aid in the removal and destruction of various pollutants. Therefore, the statutory preference for remedies that employ treatment as a principal element is satisfied.

OTT/STORY/CORDOVA SITE
NORTH MUSKEGON, MICHIGAN

RESPONSIVENESS SUMMARY

INTRODUCTION

The purpose of this responsiveness summary is to document the comments received during the public comment period, and the response of the United States Environmental Protection Agency (U.S. EPA) to these comments. All of the comments summarized in this document were considered prior to U.S. EPA's final decision. The responsiveness summary is divided into two sections. The Site Overview and Background on Community Involvement section provides a brief site history, and notes concerns expressed by citizens at various points. The Summary of Public Comments Received During The Public Comment Period and U.S. EPA Responses section summarizes citizen oral and written comments, followed by U.S. EPA response. In some instances, recurring comments addressing a common subject will be grouped according to issue, and responded to together.

SITE OVERVIEW AND BACKGROUND ON COMMUNITY INVOLVEMENT

The Ott/Story/Cordova Superfund site is a former specialty organic chemical production facility located at the eastern end of Agard Road in Dalton Township, Michigan. A distinctive part of the site from 1958-1977 was the usage of lagoons to accept industrial wastewaters and for a time high strength waste "heels" following vessel cleanout.

The Remedial Investigation (RI) noted significant pollution of groundwater beneath and downgradient of the site. At least a portion of this contaminated aquifer is discharging into Little Bear Creek and its unnamed tributary, located about one-half mile southeast of the site. While consideration must be given to restoration of a Class II aquifer and certain site areas where soil contamination is prominent, the basic objective of this interim action is to halt the movement of contaminated groundwater into the Little Bear Creek system.

As noted in the Administrative Record, community involvement with the Ott/Story/Cordova site began as far back as the 1970's. As an example, a letter transmitted in August 1975 from the Muskegon County Health Department relayed citizen concern over odor problems attributed to the site. The spread of contaminated groundwater eastward from the site and its possible effects upon residential well water supplies further heightened community involvement. In the late 1970's, certain citizens filed suit against a person they believed to be a former site owner. The Administrative Record indicates that in 1981, this suit was settled, the outcome being extension of an alternate water supply into the area. In 1982, the site was placed on the National Priorities List. In November 1987, U.S. EPA conducted a Remedial Investigation "kick-off" availability session at the Dalton Township Hall, located near the site. Both the Dalton Township Hall and the Walker Memorial Library in North Muskegon have served as local information repositories throughout the Remedial Investigation/Feasibility Study (RI/FS) process. Concerns expressed to U.S. EPA by citizens during the RI process are:

-- Concern over property value and illiquidity.

-- A frustration of "enough study - it is time to get on with the business of cleanup".

On August 16, 1989, the U.S. EPA conducted an availability session and a formal public hearing to discuss key RI findings, and to present the Proposed Plan for remedial action, as generated by the Focused Feasibility Study (FFS). The public comment period was initiated on August 1, 1989. An advertisement was placed in the "Muskegon Chronicle" announcing the beginning of the comment period, the local availability of the Proposed Plan and FFS report, and the time and place of the availability session and public meeting.

SUMMARY OF PUBLIC COMMENTS RECEIVED DURING THE PUBLIC COMMENT PERIOD

ORAL COMMENTARY RECEIVED AT THE PUBLIC MEETING

COMMENT 1: Mr. Gollach, area resident, commented that he did not favor Alternative 6 or 7, and fears that discharges routed to the local public operated treatment works (POTW) may cause problems with or overload that system.

RESPONSE: U.S. EPA takes careful note of these views. While routing a discharge from the Ott/Story/Cordova (O/S/C) site to the POTW may be physically possible, U.S. EPA believes that such a choice imposes a burden on it to demonstrate that an effluent leaving the O/S/C site will not impair or interfere with POTW performance. Given the numerous compounds associated with the O/S/C site, such demonstration would be a complex undertaking. Further, to the best of U.S. EPA's information and belief, the Muskegon County POTW is considering physical expansion. However, such expansion did not include a sizeable discharge of treated groundwater from the O/S/C site. Hence, if such discharge from the site to the POTW were to occur, U.S. EPA believes it would be necessary to negotiate for an incremental share of such expansion. For these reasons, U.S. EPA believes a stream discharge, rather than a POTW discharge, is appropriate.

COMMENT 2: Mr. Hughes, area resident, expressed concern about contaminated ground and expressed concern that U.S. EPA address treatment of such ground in addition to groundwater cleanup.

RESPONSE: U.S. EPA believes this citizen raises a valid point. The RI conducted for the site noted several instances of contaminated soils. U.S. EPA agrees that it is appropriate to consider whether such areas could act as potential sources of new releases into the groundwater system. U.S. EPA will consider this question in the Feasibility Study (FS) now in preparation for this site, and intends to explore its findings and recommendations with the public.

COMMENT 3: Mr. Vogel identified himself as a former resident living nearby the site. He expressed the desire to see U.S. EPA conduct a health study of the area, as well as undertake groundwater cleanup.

RESPONSE: U.S. EPA will consider carefully the citizen's views on groundwater cleanup. As to the health study, U.S. EPA notes that when the "Superfund" statute was reauthorized, Congress required the Agency of Toxic Substances and Disease Registry to perform a health assessment of all NPL sites, of which O/S/C is one. Pending determinations made within this health assessment, ATSDR may recommend more study or medical monitoring of a given area/population. One such outcome may be a health study. While U.S. EPA does not perform health assessments/studies, U.S. EPA will be pleased to make your views known to the ATSDR representatives stationed in Chicago.

COMMENT 4: Mr. Gollach notes that he is submitting written material to U.S. EPA to forward to ATSDR and supports the view that a health study be performed.

RESPONSE: As noted in the previous response, U.S. EPA will relay the views of citizens to ATSDR as with regard to the matter of a health study.

COMMENT 5: Mr. Weisner, former employee and current resident, expressed concern that U.S. EPA only took soil samples to a depth of six inches and missed site areas he believes may be high in pollutants. Mr. Weisner believes that U.S. EPA should move aggressively to get rid of polluted soils, such as by incineration while also treating groundwater. This citizen identified himself as a former site worker, and recalled spills and waste disposal in the vicinity of former site buildings. Mr. Weisner observed that it is his belief that some trees on the site died because of pollutants. This citizen further noted past management may have misled workers as to the potentially harmful effects of working with certain site chemicals. This citizen believes U.S. EPA should follow a similar course of action as was developed by Uniroyal, and believes elements of that plan included provision for incineration of polluted soil.

RESPONSE: U.S. EPA notes with care the views expressed on the instances of spillage during times of plant operation. U.S. EPA wishes to point out that soil sampling was not confined to shallow samples only. Indeed, during the RI five borings to depths of approximately 150-170 feet were performed and instances of pollutants appearing at substantial depth were noted. As noted in other responses, U.S. EPA will relay to ATSDR views expressed on health matters. As noted in the response to Mr. Hughes, U.S. EPA most definitely will consider the matter of contaminated soils, and the possible need to treat or bring about disposal of such soils. In reviewing documents concerning this site, U.S. EPA has noted instances of the Uniroyal discussions with the State of Michigan, and has placed documents dated 11/27/76, 01/03/77, and 01/17/77 in to the Administrative Record for this site. U.S. EPA also notes with care the commenter's views on the need to treat site groundwater, and views on possible damage to site vegetation caused by past site waste management practices.

COMMENT 6: Mr. Gollach noted that he is aware U.S. EPA samples were also taken at depth.

RESPONSE: No further response is required of U.S. EPA at this time.

COMMENT 7: Ms. Kirk, counsel representing CPC, objects to the lack of a comment period for the RI, to the insufficient time period for review of the FFS, and the failure of U.S. EPA to allow access to certain studies and data.

RESPONSE: Via numerous Freedom of Information Act (FOIA) requests, U.S. EPA has received from Ms. Kirk's firm, U.S. EPA has supplied voluminous data concerning the site. U.S. EPA denies that it has wrongfully failed to provide access to site data. U.S. EPA is not bound to conduct a public comment period on the RI. U.S. EPA supplied a copy of the RI to Ms. Kirk's firm when supplies were made available last spring. U.S. EPA has received numerous comments and submittals from Ms. Kirk's firm on the conduct of the RI and other site related information. U.S. EPA has placed a tremendous amount of such information in the Administrative Record for this site. Further, while Ms. Kirk's firm is the only party stating that the public comment period is insufficient, U.S. EPA has nonetheless extended receipt of written comment concerning the Proposed Plan.

COMMENT 8: Ms. Robbins, area resident, notes that she wishes U.S. EPA every success on our cleanup efforts at O/S/C, but regrets that such efforts are over ten years and numerous cancer deaths too late.

RESPONSE: In all honesty, U.S. EPA cannot make a fitting response to this comment.

COMMENT 9: Mr. Gollach notes a past citizens' suit to try to get a water supply extended to the area. He states that he disagrees with Ms. Kirk's comments.

COMMENT 10: Ms. Kirk notes in settlement of such suit her client contributed close to a million dollars for construction of such supply, and further notes denial of responsibility for operating the site.

COMMENT 11: Mr. Weisner notes he believes significant pollution took place when Ott Chemical operated independently.

RESPONSE: No further response is required of U.S. EPA at this time.

COMMENT 12: Mr. Gollach believes U.S. EPA should not overlook Mr. Ott in the final responsibility for the problem brought here.

RESPONSE: U.S. EPA will consider this comment with care.

COMMENT 13: Mr. Pringle, a citizen living near the site, notes that at one time Ott Chemical had a plan for deep well injection of wastes, but never executed this plan, and this may account for the pollution problem that now exists.

RESPONSE: U.S. EPA appreciates the information provided by this citizen.

COMMENT 14: Ms. Harrison, area resident, notes three main areas of concern: (a) her belief that a health study is badly needed, (b) a concern that U.S. EPA's sampling effort did not go far enough to the south, and (c) a hope for a meeting forum that will include more questions and answers so that the public may better pose comments.

RESPONSE: As noted in the response to Mr. Vogel and others, U.S. EPA will relay citizen concerns for a health study to ATSDR. U.S. EPA also appreciates this citizen's views on sampling extent. The charts and graphs U.S. EPA used in discussing key RI findings did not include all wells sampled, but rather those that seemed of more significance. Of relevance to this commenter's point, U.S. EPA notes a sharp distinction between upgradient wells somewhat northwest of the site and site wells. The upgradient wells showed a virtual absence of pollutants; site wells in numerous cases were heavily polluted. Ideally, one would like to find that same distinction point to the south. While some wells on River Road south of the site were relatively clean, others were still highly polluted. While U.S. EPA believes sufficient knowledge has been gained to undertake the action discussed in the Proposed Plan, further refinement of the southern limits of contamination may be needed. U.S. EPA also is appreciative of this citizen's views on the need to have better "give and take". U.S. EPA notes that earlier in the day, we did conduct a less formal availability session in an attempt to serve this purpose. If some people's personal schedules prevented them from attending, please be assured we are a phone call or a letter away. Also, U.S. EPA does maintain local information repositories, so that information can be reviewed in more depth.

COMMENT 15: Mr. Vogel, area resident, notes that more detailed information would help citizens comment.

RESPONSE: U.S. EPA refers to the response given on the third part of the previous comment.

COMMENT 16: Mr. Gollach notes he believes the extraction wells will be in the creek.

RESPONSE:	This is not correct. U.S. EPA envisions extraction wells set back somewhat from the creeks.
COMMENT 17:	Mr. Weisner suggests the possibility of "well mobility" in going from one pocket of highly contaminated groundwater to another.
RESPONSE:	Regrettably, U.S. EPA is not aware of how we may make the wells mobile. However, U.S. EPA believes this comment hits upon an important point. While U.S. EPA sees a clear role to be served by extraction wells in the vicinity of the creek acting to intercept contamination before it enters the creek system, U.S. EPA sees value in other wells located near areas of high contamination, and will explore this concept in the Feasibility Study (FS) for the site.
COMMENT 18:	Ms. Hamil, area resident, notes that she finds it implausible for all of the contaminated groundwater to run into the Little Bear Creek system, and is concerned about possible movement to the west.
RESPONSE:	U.S. EPA notes that upon review of site information, we too express doubt in the view, expressed by certain PRP representatives, that Little Bear Creek is the ultimate receptor of groundwater flow from the site. It appears to U.S. EPA that Little Bear Creek's influence on the groundwater regime in the area must be finite. While Little Bear Creek does appear to receive a considerable loading of pollutants from shallower aquifer portions, there must be a subsurface depth below which Little Bear Creek cannot influence flow. U.S. EPA is evaluating ground water remediation for the entire site in the FS currently in preparation. This FS will deal with groundwater flow besides that in the Little Bear Creek area.

COMMENT 19: Ms. Ames, area resident, regrets the lack of a question and answer session during the comment session.

RESPONSE: U.S. EPA notes that many citizens took advantage of a question and answer session held immediately afterwards.

COMMENT 20: Ms. Harrison expressed concern over the fate of the water table, and whether well users should be concerned.

RESPONSE: Please refer to the response below to Mr. Gollach's written comments (see Written Comment No. 2), which touched on a similar point.

COMMENT 21: Mr. Gollach observed that he hopes the drinking water available to the panelists was not from the site, because we'll never get the place cleaned-up if it is.

RESPONSE: U.S. EPA notes that we are still here. Evidently, the water's source was elsewhere.

WRITTEN COMMENTARY RECEIVED DURING PUBLIC COMMENT PERIOD

COMMENT 1: August 18, 1989 -- Mr. Weisner recommends the dredging out of sand/sediments in the vicinity of the Bowmen's Club.

RESPONSE: We believe that the act of intercepting contaminated groundwater and providing adequate treatment will allow opportunity for stream recovery. We do not believe removal of sediments is necessary initially. However, U.S. EPA does not rule out the possibility of future sediment removed to enhance stream recovery. Any such action though must be carefully considered so as not to cause undue siltation problems. The effectiveness of the groundwater interception and impact upon stream recovery will be carefully monitored, and, if deemed necessary in the future, sediment removal will be considered.

COMMENT 2: Mr. Gollach delivered written material to U.S. EPA at the August 16, 1989 public meeting. Mr. Gollach urged that a health study be done, and expressed concern over the zone of influence of extraction wells.

RESPONSE: U.S. EPA shares Mr. Gollach's concerns about human health. The Agency for Toxic Substances and Disease Registry (ATSDR) is aware of the circumstances surrounding this site and is evaluating the need for this study. The U.S. EPA has modelled the influence of the extraction wells on the water table of the upper aquifer. Based upon the modelling results, the cone of influence created by the pumping wells along the unnamed tributary and Little Bear Creek is approximately 3,000 feet at its maximum radial distance. The upper aquifer in the vicinity of the O/S/C site has a relatively high transmissivity (40,000-60,000 gpd/ft). Wells pumping at the Nor-Am Chemical site, 5,000 feet south of the O/S/C facility, pump approximately 200-500 gpm without causing a significant (less than 1 foot) decrease in the groundwater table. The proposed extraction wells will have no significant influence on the water table in the one to three mile radius.

COMMENT 3: August 21, 1989 from U.S. Dept. of the Interior (DOI)--Fish and Wildlife -- Letter urges U.S. EPA to consider placement of the extraction wells on higher ground away from the creeks such that construction in the floodplain/wetlands area is minimized and that seeps within the floodplain can also be intercepted. It is also recommended that the level of treatment specified in the NPDES permit be consistent with the recipient water body's designation as a trout stream. U.S. DOI also urges discharge to Little Bear Creek of treated water at a relatively upgradient position in order to supply water to preserve wetlands and help "flush" the creek.

RESPONSE: U.S. EPA appreciates the comments from the Fish and Wildlife Service. As the extraction system is envisioned, the impact and zone of influence of the pumping wells will indeed provide protection to the flooded wetlands, as well as the impacted areas of the two creeks. Extraction wells will definitely be placed upgradient out of the floodplain/wetlands. Only minor construction is envisioned for the surface water discharge location. We intend to supply such information to the selected contracting firm that develops the Remedial Design Plans for this action. U.S. EPA will also note these concerns in the Statement of Work it will supply to such design contractor.

COMMENT 4: August 24, 1989 from counsel for CPC, International. Letter notes that U.S. EPA is creating two groundwater treatment plans, that this first plan only has an envisioned life of five years, that there can be no conclusion of imminent and substantial endangerment with regard to this action, that air quality data is unusable and conclusions made from its usage not appropriate, and that the only toxicity problems in Little Bear Creek are related to certain metals not associated with the site.

RESPONSE: U.S. EPA is not creating two groundwater remedial actions. This action is to alleviate a surface water contamination problem while other evaluation proceeds. U.S. EPA perceives that a portion of the overall contaminated groundwater system, namely that portion in the vicinity of Little Bear Creek, is the source of the surface water problem. Hence, this is a limited action to control that source. The goal at this time is not one of groundwater remediation, but of stream recovery and the protection of human health. The assertion that there is no imminent and substantial endangerment is incorrect. The results of the endangerment assessment show that contaminants entering the ambient air from the groundwater discharges pose excess lifetime cancer risk to human populations. Clearly the organic pollutants found in the Little Bear Creek system match the pollutants in the monitoring wells at O/S/C. As shown in the following table, the levels of certain hazardous substances found in Little Bear Creek and derived from the entry of contaminated groundwater, exceed drinking water criteria (benzene, vinyl chloride, 1,2-dichloroethane), Michigan ambient water quality criteria (chloroform and vinyl chloride), and U.S. EPA criteria for water-organism ingestion (benzene). Further, all these organic compounds noted above are known or probable human carcinogens.

Contaminant	USEPA MCL (ug/l)	Michigan Rule 57 Water Quality Guidelines (ug/l)	Ambient Water Quality Criteria Ingest-ion of Water & Fish (ug/l)	Observed Stream Concentration (ug/l)
Benzene	5	51	0.66	26
Chloroform	-	43	0.19	85
1,2-dichloroethane	5	560	0.94	140
Vinyl chloride	2	3.1	2	52

U.S. EPA clearly identified within the RI that copper and mercury levels were high throughout the stream valley and not site related. The assertion that these metals are the only substances of a toxic nature is incorrect, given the carcinogenic behavior of the organics discussed. U.S. EPA believes these findings of surface water quality in itself justifies a conclusion that there is an imminent and substantial endangerment. Given the volatile nature of many of these compounds, U.S. EPA also perceives that their entry into the air from the stream creates an exposure pathway for persons nearby. U.S. EPA believes that the 11/13/86 MDNR memorandum from R. Teoh--placed in the Administrative Record--justifies usage of certain MDNR air data.

The consultant for CPC, Mr. Lodge, notes that "it is clear that these compounds are leaving the water and entering the atmosphere".

The validity of the methods used in the RSI report in its air model is in question, as noted in Mr. Teoh's review, the results and conclusions, however, are interesting. The RSI report concludes that the result, generated by using "actual" field data, show the air concentrations are below MDNR air standards and there is "no risk". The following is a table showing RSI calculated air concentrations:

AMBIENT AIR CONCENTRATION (ug/m^3)

Setting/Standard	Benzene	Vinyl Chloride	1,2-dichloroethane
3 m mix height	0.00725	0.0559	0.231
Michigan AAC ($1x10^{-6}$)	0.14	0.4	0.09

U.S. EPA notes that the RSI figures related above shows the predicted concentration for 1,2-dichloroethane is 2.6 times the Michigan AAC, not below, as stated. Interestingly, the modelled data concurs with the conclusions generated in the RI's Endangerment Assessment. Risks calculated by U.S. EPA using the EA's exposure assumption are shown below:

Compound	Modelled RSI Air Concentrations	Excess Lifetime Cancer Risk Due to Inhalation
Benzene	0.00725	5.5×10^{-8}
1,2-dichloroethane	0.231	5.5×10^{-6}
Vinyl chloride	0.0559	4.3×10^{-6}
AGGREGATE RISK:		9.8×10^{-6}

U.S. EPA often considers an excess cancer risk of 1×10^{-6} as a "benchmark" of protection. U.S. EPA is concerned when a risk is found to be greater than this level. Hence, your figures clearly demonstrate an excess cancer risk factor greater than 1×10^{-6} for the current use air inhalation pathway. Hence, U.S. EPA believes that taking any action to help eliminate such a pathway is fully justified.

COMMENTS 5: August 25, 1989 from counsel for CPC, Int'l. This letter resubmits ten previous letters to U.S. EPA from CPC, Int'l. counsel and indicates they be given consideration in U.S. EPA's responsiveness summary. While the primary purpose of the public comment period is to receive comment on the Proposed Plan, however items written prior to the public comment period cannot be written with that purpose in mind, therefore, U.S. EPA will respond as follows:

(1) February 10, 1989 -- CPC, Int'l. counsel protests U.S. EPA not providing via FOIA request a certain draft statement of work and certain residential air sampling data.

RESPONSE: U.S. EPA does not release draft work products. U.S. EPA was requested by ATSDR to gather certain air data in the vicinity of the O/S/C site. In this matter, U.S. EPA feels it is inappropriate to release such data prior to ATSDR's having had an opportunity to review and comment upon data it requested. ATSDR often views data it requests as medically related and upon consultation with ATSDR, U.S. EPA believes it acted properly in this matter.

(2) February 13, 1989 -- CPC, Int'l. counsel notes certain items as to sale and transfer of Story Chemical to Cordova Chemical, and notes certain instances of incinerator explosion at the site.

RESPONSE: For the purpose of considering relevant comment on the Proposed Plan, no response is required.

(3) February 14, 1989 -- CPC, Int'l. counsel writes to U.S. EPA stating that the creek interceptor has merit if it stands alone, but if further aquifer remediation is considered then the interceptor is inappropriate because it is 'inconsistent' with the final remedy.

RESPONSE: CPC's contention that the interceptor system is a viable option for the full site remediation is unfounded. The objective of the FFS is not restoration of the aquifer, as a whole, put prevention of groundwater discharges into the creek system. The creek interceptor does not address the highly polluted groundwater at the site as evidenced by Well W101D, nor does it address the southerly component of the groundwater contaminant plume. To state that the proposal action is inconsistent is to ignore the overall scope of actions required for the full site. The creek interceptor is but one component of the overall remedial action.

(4) February 15, 1989 -- CPC, Int'l. counsel write to U.S. EPA objecting to U.S. EPA referring to Little Bear Creek as a fishery resource.

RESPONSE: Please refer to the 07/28/89 memorandum prepared by W. Davis of U.S. EPA and the 12/11/87 letter from the Department of Interior placed in the Administrative Record for a more detailed response. For the purposes of this Responsiveness Summary, U.S. EPA believes the State of Michigan is correct in classifying a stream based on its potential for usage and not its current degraded state. U.S. EPA further notes that it does not feel bound to concur with the methodology and/or conclusions of any study in which it did not have an opportunity to have meaningful input as to scope or objective.

(5) March 1, 1989 -- CPC, Int'l. counsel demand $3,022,105 for CPC incurred response costs at the O/S/C site.

RESPONSE: Please refer to U.S. EPA's demand letter of March 3, 1989 placed in the Administrative Record for this site as being indicative of U.S. EPA response. Please note that the U.S. EPA demand for approximately $1,300,000 is substantially less than CPC's alleged expenditure through December 1988 of approximately $1,673,830 for 'recoverable' attorney's fees.

(6) March 14, 1989 -- CPC Int'l counsel takes exception to the use of MDNR air data and disagrees with the comparison of the ATSDR air data with MDNR air data.

RESPONSE: U.S. EPA addresses the issue of MDNR air data in the response to Written Comment 4. CPC misconstrues our inclusion of the ATSDR reference. U.S. EPA included the reference in the RI to ATSDR samples as a point of completeness. Sample holding time excedences prevented inclusion of the data in the report. U.S. EPA has never attempted to compare ATSDR data to MDNR air data as stated by CPC.

It is important to consider the reason, however, why ATSDR decided to request residential sampling. ATSDR became concerned over the presence of certain organic compounds in the sump water of a residence along Central Road. The sample collection and analysis was performed by CPC consultants and the results of the 2/16/88 sampling have been placed in the Administrative Record. In particular, ATSDR was concerned over the presence of vinyl chloride, because it is a known human carcinogen capable of posing a threat via the air inhalation pathway. Further, to the best of U.S. EPA's knowledge and belief, these analytical results were not forwarded to state or federal authorities by your representatives, but rather by a concerned citizen.

(7) March 14, 1989 -- CPC, Int'l. counsel notes a series of studies they have performed, instances where they allege U.S. EPA is making use of such studies, and conclude by asking if CPC shall continue this oversight activity and to confirm authorization to incur costs.

RESPONSE: As noted above, U.S. EPA does not feel bound to concur with methodology and/or conclusions of any study in which it did not have opportunity to have meaningful input as to scope or objective. U.S. EPA notes that your usage of the term "oversight" is highly inventive.

(8) March 14, 1989 -- CPC, Int'l. counsel states to U.S. EPA that a Michigan DNR letter to U.S. EPA misstates facts as to when off-site migration of a plume of contaminated groundwater occurred.

RESPONSE: U.S. EPA notes that establishing when such event occurred is not germane to the task of selecting a remedy which will protect human health and the environment as a result of such groundwater plume movement and subsequent entry into surface waters of a portion of such plume.

(9) July 11, 1989 -- CPC, Int'l. counsel provides certain information concerning off-site dumping related to the O/S/C site.

RESPONSE: Other than to place this document in the Administrative Record, no further response is required of U.S. EPA.

(10) July 26, 1989 letter from CPC, Int'l. counsel criticizing numerous elements within the RI.

(a) Counsel states that there is a limited analysis of existing data and information on the site in the RI and precludes an interim remedy.

RESPONSE: U.S. EPA disagrees with CPC's contention that an interim remedy is precluded at this stage because of a lack of information, such as groundwater quality. Indeed, given CPC's past stance on the matter - that all substantive matters are known on the site, that the data point to no action or an alternative limited to occasional monitoring, and that past U.S. EPA suggestions that there may be data gaps are merely a "schizophrenic attempt" to avoid the obvious conclusion of no action - it is interesting that CPC would now tell us that a lack of information should preclude U.S. EPA from recommending a prudent first course action.

(b) CPC states that the issue of deep aquifer flow and extent of contamination remain unresolved and that to continue with the actions at Little Bear Creek will "contradict, overlap, or duplicate" the interim action.

RESPONSE: U.S. EPA will address the issue of contamination of deeper portions of the aquifer in the overall site feasibility study, now undergoing preparation. U.S. EPA perceives that the majority of pollutants in groundwater near the Little Bear Creek system are in hydrogeologic zones "A" and "B", as noted within the Remedial Investigation. Deep wells towards old production areas do appear contaminated.

U.S. EPA will consider how to deal with such deeper lying contaminants; care must be given to avoid drawdown of more grossly polluted shallow aquifer groundwater into deeper zones.

(c) CPC states that it will be impossible to select a treatment system without further identification (of unknown contaminants) or a treatability study.

RESPONSE: U.S. EPA recognizes the complex nature of the groundwater contamination problem. As you well know, the list of raw materials and products made at this site read like an organic chemistry textbook. As you further know, the analytical procedures employed by U.S. EPA laboratories and its contract laboratories are geared toward the more commonly used chemicals in commerce, out of a universe of literally hundreds of thousands of such compounds. We then arrive at a complex question: Do we postpone a decision at a site, ignoring the clear risks posed by the positively identified hazardous substances, and wait until all compounds are known, or do we declare that a sufficient body of information is known and that our duty is to act to protect public health and the environment?

U.S. EPA believes that the risks posed by compounds positively identified are serious enough to warrant recommendation of a course of action as is developed in the Focused Feasibility Study. This is not to say that U.S. EPA dismisses the question of compounds only tentatively identified. Indeed, your assumption is correct. U.S. EPA will develop a treatability study to deal with the issue of how best to treat the complex mixture of groundwater contaminants at Ott/Story/Cordova. U.S. EPA also believes that reliance only on standard physical-chemical criteria may not be sufficient to adequately judge treatment of so complex a mixture.

(d) CPC strongly takes issue with the characterization of the risks presented by air emissions at the site.

RESPONSE: The 1986 MDNR air data was discredited, as you term it, by you and your consultant. We also note that MDNR reviewed the "RSI" study you point to, and found considerable fault with it. It seems prudent to U.S. EPA to note the concerns of state agencies charged with protecting the well being of their citizens.

Please also refer to the response to Written Comment 4 which address this issue.

(e) CPC contests the concept of "buried drums or waste" at the site, stating that plant records do not support this scenario.

RESPONSE: U.S. EPA, in reviewing data gathered in the RI's, saddened and dismayed to note the astonishingly high levels of contaminants in soils and groundwater near central portions of the old production areas. Contentions raised by some, that all of the material that could have entered the groundwater has long since done so and that there is nothing new to find out about the site because the last remnants of this contamination are now bleeding off into Little Bear Creek, appear to be in serious doubt. If all materials have long since entered the groundwater and moved downgradient, why then did U.S. EPA's well cluster W101, installed north of Agard Road turn up such a large variety of contaminants at such high levels? What can account for their presence? U.S. EPA has received accounts from citizens of supposed waste disposed at various points around the plant. In an effort to investigate such reports in a cost-effective manner, U.S. EPA has performed geophysical investigations at the site. We have found two areas yielding unusual anomalies just south of Agard Road and south of the equalization basin. These areas are in no way related to utility lines, and U.S. EPA reserves the right to perform exploratory borings as a part of feasibility study development. Further, the concept of "source" of additional groundwater pollutants is not limited to buried drums. We perceive that the soils themselves in central areas of the site pose a threat of further release of contamination.

(f) CPC has been given no opportunity to comment on a draft RI before Region V announced it was final.

RESPONSE: The U.S. EPA does not release draft documents to the public.

(g) CPC states that the only risks presented in the RI's Endangerment Assessment are premised on unrealistic future use scenarios with flawed baseline data. CPC argues that the contaminated groundwater plume has been moving southeast from the site and discharging to the unnamed tributary and Little Bear Creek since mid-1975, and that some degree of natural recovery is occurring in Little Bear Creek.

RESPONSE: "Unrealistic future use scenarios"? We remind you that once, before it was so hideously defiled, this aquifer served as a potable drinking water supply, and as such deserves protection as a Class II aquifer. Perhaps it disturbs you that we bothered to calculate the degree of risk that may be posed if one happened to use groundwater from the Ott/Story/Cordova site for a water supply. As you know, as an Agency, we become concerned if a certain incremental health risk to the public exceeds one in a million. But as the RI now points out, if a person used the aquifer at well points OW9 or OW12 as a water supply, he does not face a 1 in 1,000,000 or a 1 in 100,000 chance of developing disease; no - he faces a risk of 99 out of 100 that he will develop cancer if he used such water to drink over the course of a lifetime.

Further, we express doubt over your contention that it was only since mid-1975 that the plume was moving southeast from the site.

(h) CPC states that it is worth noting that, as indicated in the attached (York Services, July 1989), the RI has so far confirmed that the plume is purging itself over a period of years (estimated to end between 1990 and 2019) and that "simply put, Little Bear Creek appears to be effectively volatilizing/assimulating the contaminants of concern".

RESPONSE: U.S. EPA notes that CPC's consultant refers to his calculations yielding the years cited as "speculative". U.S. EPA is surprised your letter of 7/26/89 did not also advise of the speculative nature of the calculations. U.S. EPA also takes note that your own consultant, again in Exhibit 3, was not able to conclude that Little Bear Creek is the ultimate barrier/receptor to all groundwater flow from the Ott/Story/Cordova site. This appears to bear out similar concerns raised by U.S. EPA.

COMMENT 6: August 28, 1989 from counsel for CPC, Int'l. Counsel alleges that the Administrative Record is seriously deficient and notes that Section 117 of SARA calls for reasonable opportunity for written and oral comment upon the proposed remedy. Counsel further notes that U.S. EPA should extend the public comment period. Counsel further notes that a public meeting must be held and the transcript made available. Counsel further notes that the Administrative Record be made available at or near the specific site. Counsel alleges U.S. EPA has not prepared an index for materials in the Record. Counsel reminds U.S. EPA of the need to provide for participation of interested persons in development of the Administrative Record. Counsel again, as per earlier comment, objects to U.S. EPA withholding certain residential indoor air sampling results despite FOIA requests for all records. In a similar manner, Counsel alleges the absence of information about the ultraviolet oxidation process.

RESPONSE: U.S. EPA notes again the obvious: That a public meeting was held August 16, 1989 in the Dalton Township Hall to consider comment upon the Proposed Plan. As noted earlier despite the fact that U.S. EPA has received only one request to extend the public comment period (from counsel for CPC, Int'l), U.S. EPA extends the time for receipt of written commentary. U.S. EPA sent on August 31 to CPC, Int'l. counsel a copy of the Administrative Record Index as it existed through August 10, 1989. Obviously, U.S. EPA will adjust this Index to reflect receipt of comment. U.S. EPA notes that the entire Record is indeed available at or near the site, namely at the Walker Memorial Library in North Muskegon. U.S. EPA emphatically denies that the Record is seriously deficient, or that U.S. EPA has precluded participation of interested persons in Record development. U.S. EPA cites the voluminous inclusion of materials sent to U.S. EPA by CPC, Int'l. counsel in the Administrative Record.

U.S. EPA again states that it does not feel bound to accept the conclusions of reports or studies in which it had no opportunity for meaningful participation. Finally, U.S. EPA again denies that it wrongfully withheld data, and cites its response to the August 25 comment noted above.

COMMENT 7: August 28, 1989 letter from CPC, Int'l. counsel listing various questions concerning the RI/FFS.

(1) Are any of the wetlands characterized or otherwise identified?

RESPONSE: The RI report extensively discusses and characterizes the Little Bear Creek and the unnamed tributary. The concept of floodplains and wetlands are basic to any impact or remedial action discussion. Items supplied in the administrative record reflect the impacted areas classification as flooded wetlands and protected ecosystems (Memo: 12/11/87, U.S. Dept. of Interior - Fish & Wildlife Service)

(2) Are performance standard protocols available for physical, chemical, and biological indicators?

RESPONSE: The performance standard protocol to be used to verify the effectiveness of the remedial actions are to be based upon the stated goals and objectives of the FFS. Detailed monitoring protocol are developed in the Work Plan for the Remedial Design. It is inappropriate in the FFS or Proposed Plan to develop this detail.

(3) Have the water quality and quantity and flow dynamics of the surface waters been characterized sufficiently to determine the impacts from the proposed stream discharge?

RESPONSE: The U.S. EPA has provided details of the proposed stream discharge to MDNR for consideration in the development of the NPDES limits. Included in this information are proposed discharge rates and locations as noted in the appendices. Sufficient information is available to proceed with the discharge limit development.

(4) The FFS continues to suggest the presence of buried wastes as contaminant sources. Ir there any date to support this continuing assertion?

RESPONSE: Please refer to Written Comment 5.10.e.

(5) The groundwater modelling does not allow for adsorption or retention in the soil/groundwater matrices. How does this fact affect the suggested size, shape and concentration profile of the plume?

RESPONSE: The modelled size of the groundwater contaminant plume was approximately 15 percent greater than suggested in the RI. However, the concentration of contaminants and the general shape of the plume are the same as discussed in the RI.

(6) Why is the "shorthand" sum of organic constituents used to express plume definition rather than the analytically measured (TOC) parameter?

RESPONSE: The use of the "total organic contaminant" is the summation of actual analytically measured individual groundwater contaminants. The parameter, the commentor suggests be used, TOC (Total Organic Carbon), although an analytical measure, is a gross indicator parameter of general contamination, and is not as meaningful as the actual contaminant totals in defining the level of pollution found.

(7) Has any theory or explanation been forwarded to explain why OW-12 contamination is orders of magnitude greater than similarly situated wells?

RESPONSE: A comparison of monitoring well screened at "similarly situated" geologic intervals and depths as OW-12 in the contaminant plume did indeed have similar magnitudes of contamination. These wells include OW23, OW9D, W24, W25, and K28D. It is interesting to note that OW-12 is locally known as the "root beer" well because the dark amber color of the groundwater and of its foaming action when sampled.

(8) Can Little Bear Creek accept a 400 gpm discharge without erosion or other negative in-stream impacts?

RESPONSE: The impact of erosion on the stream due to discharge at Little Bear Creek will be minimal. As cited in your "Exhibit 3" of your July 26 RI review, Little Bear Creek has an approximate flow of 9.2 ft^3/second and an "average plume discharge" of 0.31 to 0.97 ft^3/sec. The proposed discharge of 400 gpm (0.99 ft^3/sec) would have minimal impact on the receiving stream. The engineered discharge structure would prevent erosion by minimizing the discharge velocity.

(9) How are meaningful evaluations of treatment options being considered when 85% of the TOC contamination is undefined? Are the results of bench and/or pilot scale testing available for various treatment train components?

RESPONSE: The U.S. EPA believes that given the high BOD level found in several wells, conventional biological treatment has a role to play, provided initial treatment steps help eliminate the toxicity problems associated with the pollutants. Various bench-scale studies have been performed on O/S/C groundwater previously (Shuckrow, Pajak, Oseka, and James, 1980;

Touhill, Shuckrow and Associates, Inc., 1979; James, Shuckrow and Pajak, 1981). The U.S. EPA has also initiated preliminary bench-scale testing of the UV enhanced oxidation process using groundwater from the site. The results of the bench-scale testing are currently being evaluated.

(10) How were treatment modules paired with extraction/collection modules?

RESPONSE: The methodology we used to combine treatment technologies with extraction/collections modules were defined in the FFS. We refer the commentors to this document.

(11) What is the status of the UV pilot/bench scale testing in? Are the results available?

RESPONSE: Please refer to comments supplied above in Written Comment 7.9.

(12) What are the current FS plans for POTW use?

RESPONSE: U.S. EPA, as noted in the FFS, is considering the impacts of discharge upon the POTW, potential capital improvements required for the additional flows and indications from POTW officials that the discharge may not be accepted. In light of these issues, the POTW use for the FS is not being considered.

(13) What are the expected effects of FFS remedial plan on stream flow regimes? How do they effect stream biota? Is the drying-up of the streams detrimental to natural systems including wetlands?

RESPONSE: Elimination of the groundwater discharge to Little Bear Creek and the unnamed tributary will reduce stream flow. Surface water flow to the tributary would be reduced to runoff due to precipitation. The effect may be detrimental to the wetlands. For this reason, U.S. EPA is carefully considering the commentary provided by U.S. DOI - Fish and Wildlife Service on stream locations in an effort to preserve the wetlands.

(14) What are the NPDES discharge objectives under consideration by MDNR? How do they compare to the POTW requirements?

RESPONSE: The U.S. EPA has received from MDNR the requirements for the NPDES discharge. They are available in the Administrative Record for your review and comparison.

(15) If MCL standards do not apply to the surface water discharge, and NPDES standards will be developed at a later date, and current levels are below USEPA WQC, what effluent levels were used for treatability technology screening analysis in the FFS?

RESPONSE: The commentor incorrectly uses the current surface water analytical results to compare to limitations placed upon a treatment technologies discharge. As can be seen in Appendix B of the FFS, the U.S. EPA Water Quality Criteria and the Michigan Surface Water Quality Guidelines were used in considering these technologies.

(16) Has a complete inventory of all existing monitoring well data been completed?

RESPONSE: An inventory of known monitoring well data is supplied in the RI/FS Work Plan.

(17) Why hasn't the creek underflow issue been resolved?

RESPONSE: The U.S. EPA firmly believes that Little Bear Creek has only a limited ability to influence groundwater movement particularly in Zone C. Groundwater in the semi-confined system, Zone C, is not expected to be significantly influenced by the creeks and therefore continues to flow east/southeast below the creek.

(18) Are seep sources located and quantified?

RESPONSE: Ground water seeps to Little Bear Creek are evident from the confluence of the unnamed tributary and Little Bear Creek to south of River Road. Seeps to the unnamed tributary are evident from the dam of the pond behind Bowman's Club to the confluence of the unnamed tributary and Little Bear Creek. It is also probable that seeps occur beneath the surface waters of the tributary, and Little Bear Creek. While quantification of the number of seeps has not been made, it is not necessary to know the number to proceed with the remedial action.

(19) Is permanent stream flow instrumentation planned?

RESPONSE: The U.S. EPA is not currently contemplating installation of permanent stream flow instrumentation. MDNR currently maintain staff guages in the creek. We do reserve the right to implement such instrumentation in the future.

(20) Is a 400 GPM purge rate necessary? Rather than dewater the tributary would a reverse hydraulic gradient from the tributary to pump-out wells be adequate?

RESPONSE: U.S. EPA believes, based upon our analysis of the ground-water system, the 400 gpm is necessary and appropriate to achieve the objectives of the Proposed Plan.

(21) Could the treatment facilities be relocated from the O/S/C Site closer toward the purge and discharge point (i.e., near River Road) to reduce costs for piping and pumping?

RESPONSE: U.S. EPA believes a treatment site nearer to the O/S/C facility may be more implementable because it imposes less a burden on residentially held land near the streams.

(22) Explain the air sampling programs that provided data for use in the RI and endangerment assessments. Are QA/QC available? Are the ATSDR results available for the 1988 samples?

RESPONSE: The commentor is referred to response to Written Comment 4, which addresses this issue.

(23) Why were institutional controls as an independent interim measure not fully evaluated?

RESPONSE: U.S. EPA believes it is inappropriate to speak in terms of "institutional controls" to address surface water degradation problems in streams where, to the best of U.S. EPA's knowledge and belief, the stream bank land is not owned by potentially responsible parties connected with this site. The citizens living in the vicinity of River, Central, and Russell Roads near this site have been denied for years full usage opportunity of a stream which is rightfully theirs, due to a problem caused not by their own doing, but by releases having their origin at the O/S/C site. The Muskegon County Health Department (MCHD), upon the recommendation of the Michigan Center for Environmental Health Study, placed warning signs in Little Bear Creek some 2-3 years ago, warning potential users of contaminated water. During the public availability session on August 16, one MCHD representative was heard by U.S. EPA to remark that it is time to order new warning signs, as the existing ones are becoming too weathered. U.S. EPA sincerely hopes this will be the last time such an order is necessary.

(24) Explain the "data verification" program.

RESPONSE: The "data verification" program used by U.S. EPA at O/S/C is described in the Quality Assurance Program Plan for the RI Work Plan.

(25) How were Modflow and Mocflow models selected for use for this site? The assumptions and calibration used for site modeling are not presented. Are they available?

RESPONSE: Both the Modflow and Mocflow models have been utilized and documented extensively in the literature. The principal components of the modelling process have been included in the supporting documents which are voluminous.

(26) Has the groundwater modeling identified the hydraulic relationship between the unconfined and semi-confined aquifers near the stream? If so, what is the hydraulic regime in this area?

RESPONSE: In the vicinity of the streams little or no hydraulic connection between the layers was possible as evidenced by the large difference in hydraulic head between the layers. Based on both existing groundwater data and the results of the modeling effort, the groundwater flow system and the fate and transport of contaminants can be characterized as follows:

- Groundwaters in the unconfined zone approach the streams to the east driven by a steep hydraulic gradient. This hydraulic gradient is created by a 40 foot drop in topography from the O/S/C site to the bottom of the unnamed tributary and Little Bear Creek. Most of the groundwater in the unconfined aquifer from the O/S/C site flows south below the existing stream channel following the groundwater flow created by the unnamed tributary and Little Bear Creek.

- Groundwaters in the semi-confined zone approach the streams to the east/southeast, but are driven by a much smaller hydraulic gradient. Confining layers between the two aquifers limits leakage between the aquifers, thus as groundwaters in the semi-confined aquifer approach the streams to the east/southeast the hydraulic heads decrease at a much slower rate than the hydraulic heads in the unconfined zone. This creates a steep upward hydraulic gradient between the two zones in the vicinity of the streams.

- Groundwater contaminants (dissolved) in the unconfined aquifer will flow east/southeast until they reach the stream channel. At the stream channel the contaminants will either enter the streams as groundwater seepage or flow south below the stream channel. The limited number groundwater contaminants detected in wells screened in the unconfined aquifer east of the unnamed tributary and the presence of fairly high levels of groundwater contaminants in wells OW-12, and OW-23 supports this conclusion.

- Groundwater contaminants in the semi-confined zone will continue to flow east/southeast remaining relatively unaffected by topographic features. This conclusion is supported by the presence of semi-volatile groundwater contaminants in wells east of the unnamed tributary.

(27) Have the groundwater models suggested fate and transport regimes for various plume contaminants?

RESPONSE: Please refer to the above written comment.

(28) Was constructing the purge wells along the axis of the plume considered?

RESPONSE: Capture the plume beyond eliminating seepage of contaminated groundwater was not the objective of the FFS pumping wells. Placement of the extraction wells perpendicular to the axis of the plume at the creek is the most effective method of intercepting groundwater discharges.

(29) What is the sensitivity of treatment costs and effectiveness based on influent groundwater contaminant levels?

RESPONSE: Influent ground water contaminant levels have been predicted based on ground water modeling of the flow regime at the site coupled with current analytical results of samples taken from onsite ground water monitoring wells. The resulting influent concentrations that were predicted are expected to compare closely with the actual influent concentrations from the extraction options. The sensitivity of treatment costs and effectiveness of treatment will therefore be minimal. The recommended treatment process train has been formulated to be able to handle not only small fluctuations in concentration but also the larger changes in concentration that are expected to occur over time. The effects are most noticeable in carbon adsorption costs which are expected to decrease with time as dilution effects are encountered. The carbon adsorption unit will act as a buffer to the other treatment options. As concentrations increase the carbon unit will remove more contaminants and vise versa for a decrease in influent concentration.

(30) Why does the interim remedy have a 5-year design life?

RESPONSE: Cost evaluations for remedial alternatives in the FFS were based upon a "five year design life". As stated in the FFS, this is because future remedial actions at the O/S/C site may have a major impact upon operational and maintenance cost over the lifetime of the remedial action. The cost consideration may require re-evaluation once the full site remediation has begun. The actual "working life" of the proposed FFS action is far longer than 5 years.

(31) Will any of the proposed interim stream remediation plans reduce surface H_2O or sediment metal concentrations?

RESPONSE: The U.S. EPA believes that concentrations of metals in the surface water and sediments are related to background concentrations and as such, require no remediation on this basis.

(32) How are the preferred FFS alternatives considered "fundamentally compatible" with the probable FS remedies?

RESPONSE: U.S. EPA perceives three problems at O/S/C -- Contaminated soils, contaminated groundwater, and contaminated surface water caused by a portion of the contaminated groundwater. This action will address the latter instance of contamination.

COMMENT 8: August 30, 1989 letter from CPC, Int'l. counsel to U.S. EPA noting that "as you know" CPC initiated the concept of a Little Bear Creek interceptor remedy in 1987, U.S. EPA's groundwater pump and treat scheme is wholly unjustified, that U.S. EPA violates its own guidance, and that no imminent hazard exists at the O/S/C site.

RESPONSE: U.S. EPA, for reasons stated above in the response to CPC's letter of August 24, 1989, notes that an imminent and substantial endangerment exists at the O/S/C site; hence, a plan to alleviate certain of those hazards associated with contaminated surface water is justified. U.S. EPA notes that the citation provided by CPC counsel, p. 3-8, is incorrect. The quotation noted by CPC may be found on p. 3-4. U.S. EPA believes CPC assertion, that the zones of contamination are closely interconnected and "defy compartmentalization" is also incorrect.

U.S. EPA believes the geological zones cited in the RI are sufficiently different, and that contamination in shallower zones near the creeks may be addressed. U.S. EPA also notes that p. 3-4 cites other factors that "... can help to identify potential operable units..." One of these is "Presence and location of hot spots -- Can a remedial action be implemented to reduce or eliminate hot spots without adversely affecting the overall plume?..." In this case, the answer is Yes! U.S. EPA perceives the surface water contamination caused by the influx of a portion of the plume as such a "hot spot"!

U.S. EPA is also eager to respond to the comment, "As you know... in 1987"! No, U.S. EPA did not know of this proposal in 1987, although CPC was apparently negotiating with the State of Michigan over implementing an underdrain collection system with no provision for treatment of the contaminated groundwater. Indeed, as the Administrative Record shows, a February 17, 1988 letter from counsel for Aerojet to counsel for CPC suggested that maybe it would be a good idea to eventually let U.S. EPA know what it was that CPC had been discussing with Michigan. U.S. EPA also have come to understand that one condition of Michigan acceptance of this proposal was to have forbade Michigan from ever providing its 10 percent matching share for any remedy U.S. EPA might at some later point in time think appropriate. U.S. EPA believes Michigan acted wisely in rejecting such a condition.

COMMENT 9: Document generated by Wenck Associates and York Corporation for CPC titled "Technical Review, Focused Feasibility Study for Ott/Story/Cordova Site, Muskegon, Michigan" dated August 1989.

(1) Section II, Review of Objectives

(a) The reviewers state that there has been no definitive evidence presented in the RI or FFS indicating a significant threat to the environment.

RESPONSE: The U.S. EPA has reviewed all documents pertaining to the impact of contaminated groundwater discharges to the Little Bear Creek. The RI report documents extensively the degradation of environmental quality in the impacted area. We seriously disagree with the assumption that there is not a significant threat to the environment due to surface water contamination.

(b) The reviewer asserts that alternative options "notably the institutional controls option" have been neglected in the FFS.

RESPONSE: Please refer to the response to Written Comment 5.10.

(c) The reviewer states that the "risks identified" do not necessarily indicate the need that a FFS be performed for the groundwater operable unit at Little Bear Creek and its unnamed tributary.

RESPONSE: The U.S. EPA proceeded with the FFS at this location to control the source of contaminant input to the creek, most notably the contaminated groundwater. To state that the risks do not indicate the need for the FFS is unjustified by fact.

(d) The review takes exception to inclusion of the stream underflow in the objects and notes that the issue of creek underflow is related to the semi-confined aquifer.

RESPONSE: The U.S. EPA agrees that the issue of stream underflow is related to the semi-confined zone. However, analytical results during the RI do indicate that contamination has traveled east of Little Bear Creek in the unconfined system.

(f) The reviewer questions the "integrity and applicability" of the air data used to generate the endangerment assessment.

RESPONSE: Please refer to the response to Written Comment 4 which addresses this issue.

(g) The reviewer comments that the risk assessment used "qualitative terms" when discussing the calculated risk at Little Bear Creek.

RESPONSE: The U.S. EPA, in describing the health risks at Little Bear Creek, did indeed use qualitative descriptions of the serious risk incurred by volatile emissions at the Creek. We also backed up these qualitative description with actual quantitative results which the review has overlooked.

(h) The review asserts that the risks identified in the FFS associated with the use of groundwater as a potable source are not justifications that a "FFS be performed".

RESPONSE: Please refer to the response to Written Comment 5.10.g.

(i) The reviewer questions why the institutional controls option, while returned for inclusion of each response action, is not and of itself referred to as an interim option.

RESPONSE: Please refer to the response to Written Comment 5.10.

(2) Section III - Compatibility with Long-term Remedies

(a) The reviewer questions the compatability of the pump-out system with any long-term solution at the site and states the system may actually make the situation worse.

RESPONSE: The U.S. EPA questions how this situation could actually become much worse than it is. The pump-out wells were considered as an interim action which would be compatible with any remedial action that will be implemented at the site.

(b) The reviewer contends that the RI did not contain ample hydrological data to analyze the complex hydrogeology of the site.

RESPONSE: The volume of hydrogeological data available in the RI was more than sufficient to calibrate both groundwater flow models to existing site conditions.

(c) The reviews state that the presentation of four stratigraphic zones (A through D) as presented in the RI is an oversimplification and obscures the complexity and variability of the underlying lithology at the O/S/C site.

RESPONSE: The simplification of complex settings is practiced in virtually every branch of science and engineering in order to allow the development of solutions to problems. Hydrogeologic data collected at the O/S/C site to date indicates that the four units outlined in the RI report do have local variability, but they can be correlated across the site. In addition, it is common practice in complex hydrogeologic environments to group similar geologic units together and derive equivalent vertical and horizontal conductivities based on derivations of Darcy's law.

(d) The review questions how the groundwater models used could provide a realistic representation of the site during remediation and how applicable the models are to the site.

RESPONSE: Using the available hydrogeologic data it was possible to calibrate both Modflow and Mocflow to existing site conditions. Modflow and Mocflow are both United States Geological Survey groundwater flow programs that have been used extensively over the past decade to model a large variety of hazardous and non-hazardous waste sites with various degrees of complexity. Both models are marketed by one of the largest groundwater modeling centers in the nation, the International Groundwater Modeling Center in Indianapolis, Indiana and extensive documentation, and verification of both models is readily available.

(c) The reviewer questions the placement of the pumping wells.

RESPONSE: The objective of the pumping wells proposed in the FFS was not to remove contaminants from the most contaminated portions of the plume at the facility, but to prevent groundwater discharge into the creeks. Development of optimal well configurations for the removal of contaminated groundwater for the full site will be addressed in FS report.

(f) Given the proposed configuration of the extraction well locations, it is unclear if the extraction wells will truly keep groundwater contaminants out of the stream and meet the objectives of the FFS.

RESPONSE: The capture zone of the groundwater extraction system outlined in the FFS extends north beyond OW-12. The plume boundary outlined in the RI is an approximate boundary north of OW-12. No groundwater seeps have been documented north of OW-12. The groundwater flow direction (southeast) will complement the well locations by enhancing groundwater movement to the extraction well.

(g) The review speculates that it may not be necessary to extract groundwater at a rate of 400 gpm. It may be only necessary to reverse the hydraulic gradient from the tributary back to the extraction well. It may not be necessary to draw groundwater down below the streambed.

RESPONSE: The U.S. EPA believes, based upon the modelling, that the pumping rate of 400 gpm is necessary to prevent groundwater seepage into Little Bear Creek and the unnamed tributary.

(h) The reviewer states that the construction of the slurry wall may not be compatible with a long-term solution because of the essential irreversibility of the action.

RESPONSE: The U.S. EPA agrees with the commentor about the potential impacts of the slurry wall on the groundwater flow regime and upon the remedies for the full site.

(i) The review questions by the configuration of the extraction wells associated with the slurry wall and whether it would be effective in capturing the contaminated groundwater.

RESPONSE: The groundwater modelling of the slurry wall with two extraction wells indicates that it would be effective in meeting the objectives of the FFS.

(j) The reviewer notes that the clay zone that the slurry wall is to be keyed into is not necessarily continuous or well-defined across the area.

RESPONSE: The concerns of the reviewer are noted. The base of the clay zone does vary across the site and there are some uncertainties associated with the construction of the slurry wall. However, the slurry wall, to a depth of 90 feet, when combined with extraction, was determined by modeling to be effective in preventing migration of contaminants into the creeks.

(k) The reviewer takes issue with the "new" subject of "wetlands" and the impacts of remedial actions.

RESPONSE: Discussions concerning the "wetlands" associated with the site are not new. Documents contained in the Administrative Record (U.S. Department of Interior, 12/11/87) document the Department of Interior-Fish & Wildlife Services concerns about the impact of contaminated groundwater discharges on the wetlands area.

(a) The reviewer believes the discussion of the negative impacts on Little Bear Creek should have included other studies.

RESPONSE: Please refer to the response to Written Comment 9.1.a.

(3) Treatment/Disposal Technologies and Processes.

(a) The review questions why the reinjection/infiltration option was eliminated in the screening and wants to know why it is "not directly applicable to actions" at Little Bear Creek.

RESPONSE: The U.S. EPA believes that the implementation of the reinjection/infiltration scheme to the remedial action at Little Bear Creek is inappropriate because, at this time, it is potentially incompatible with future actions at the O/S/C facility. The cost effectiveness of a limited reinjection/

infiltration scheme is questionable. The review is correct in noting that Figure 3-2 incorrectly retains the reinjection/infiltration option.

(b) The review questions why the disposal option chosen in the Proposed Plan is surface water discharge and not the POTW. Further, an interim receipt of treated groundwater may be allowed, according to an unnamed official at the POTW.

RESPONSE: The U.S. EPA believes that the ultimate disposal of treated groundwater should ultimately be surface water discharge because it should not place the responsibility of final treatment and ultimate disposal upon the Muskegon County Wastewater Division (MCWD). Although the cost analysis and comparison of alternatives in the FFS indicate that the POTW is slightly less costly, the choice of discharge location considers not only costs but the interest of the community and administrative feasibility. Concerns by MCWD about their ability to handle the pretreated groundwater is justified by previous bad experiences with O/S/C discharges to the POTW. The MCWD has stated that it would require a substantial fee to help with the capital expansion to handle the additional flow. This fee was not included with the capital costs of the POTW analysis.

(c) The reviewer expresses concern over the "inherent uncertainties in implementation" of the UV-oxidation process. The present worth costs for the UV-oxidation option could be significantly greater than estimated. The expected VOC removal efficiency are extremely variable.

RESPONSE: The UV-oxidation process is a relatively new and innovative treatment process, as the review noted. The effectiveness of the UV-process is dependent on the individual chemical constituents molecular structure. As a pretreatment process, the UV-process is very effective in eliminating those volatile organics that are most toxic to biological treatment systems. The commentor notes that present worth cost for this process may vary significantly. This is also true for other potential treatment processes as well.

(d) If the influent contaminant levels were significantly different, will this impact the selection of available treatment schemes?

RESPONSE: The U.S. EPA believes that the influent concentrations used to develop the remedial technologies are very similar to what will be encountered once the 'switch is flipped' on the extraction scheme. Any variety in influent concentration, however, would have no impact upon the remedy selection.

(e) The commentor's notes on results of treatability studies could have a major impact upon the treatment processes that have been retained as viable alternatives.

RESPONSE: As part of the screening process of treatment alternatives for the FFS, U.S. EPA reviewed a variety of published treatability studies, including those performed on contaminated groundwater from O/S/C. This information was used in eliminating those treatment processes that were ineffective in dealing with contaminants similar to those found at the site. U.S. EPA is currently conducting a bench-scale treatability study on O/S/C groundwater using the UV-enhanced oxidation process. Results of the tests are currently being evaluated.

(f) The reviewer states that not all groundwater treatment options have been reviewed and screened by the FFS. The review suggests three, including institutional controls, one similar to Alternative 8 but with POTW discharge, and groundwater extraction followed by wetlands treatment.

RESPONSE: The U.S. EPA feels that it has not been remiss in the screening of treatment options. As previously stated in the Responsiveness Summary, the concept of institutional controls by itself is currently in use at the site and is very ineffective in protecting the public or environment. The second alternative, like Alternative 8, provides the limitation inherent to the underdrain as discussed in the FFS. The U.S. EPA considers the groundwater extraction followed by wetlands treatment by itself, as exactly what is happening currently at the creeks.

(g) The reviewer suggests further varieties of the wetland treatment scheme, but with pretreatment of the extracted groundwater.

RESPONSE: The U.S. EPA considers a wetland treatment scheme as inappropriate with the objectives of the FFS and with Little Bear Creek's designation as a trout stream.

(4) Conclusions

(a) The reviewer reiterates objections to the FFS and the Proposed Plan.

RESPONSE: Based upon the responses given to the comments in this "Review" document and upon the merit of the FFS and Proposal Plan, U.S. EPA believes it completed a "proper and thorough analysis" of all options to meet the objective of the FFS.

COMMENTS 10: Document titled "Cordova Chemical Company of Michigan's Comments on the Focused Feasibility Study and the Proposed Plan for the Ott/Story/Cordova Superfund Site" by Cordova Chemical Company and Fishback, Thompson, Carr & Huber.

(1) There is not justification for conducting an interim remedy at the site, the air data relied upon as a basis is flawed.

(a) The FFS does not provide sufficient justification for performing a partial groundwater operable remedy. The only apparent basis for proceeding with the interim remedy is the MDNR air data.

RESPONSE: U.S. EPA acknowledges Cordova's concerns about the performance of the FFS. However, we believe that the proposed remedial actions are justified by the long history of groundwater contaminant migration into Little Bear Creek and the unnamed tributary, the degradation of a stream that at one time was a haven to trout fisherman, and the risks posed to humans by the volatilization of carcinogenic organic compounds. As previously expressed in this document, the U.S. EPA upon review of the Water Quality Criteria, have noted that several WQC for volatile organics have been exceeded by contaminants detected during the RI. The U.S. EPA is concerned about the welfare and peace of mind of residents in the vicinity of the creeks who are tired of the delay in actions which would protect them.

(b) The air data is flawed... .

RESPONSE: Please refer to the response to Written Comment 4 which addresses this issue.

(c) Cordova disagrees that the ambient air quality in the vicinity of the unnamed tributary and LBC is accurately characterized by the arithmetic mean as used in the Endangerment Assessment. The sampling results are better represented by a modelled concentration or a geometric mean and dispersion and vertical stratifications occur in the vicinity.

RESPONSE: The U.S. EPA believes that results generated by actual field sampling are far superior to modelled results. The use of air modelling (see Commment 4 on RSI modelling) has only confirmed that an excess lifetime cancer risk exists at the site. The use of the geometric mean on air sampling results also confirms the U.S. EPA's assertion that there is an imminent health risk at the site. Using the geometric mean of data used in the EA, we recalculated the excess cancer risk posed by inhalation of volatile organics at the creeks (Benzene: 3.1×10^{-6} and 1,2-dichloroethane: 2.7×10^{-6}). As can be seen, this exceeds the 'benchmark' of 1×10^{-6} excess lifetime cancer risk.

(d) Cordova states that the selection of remedy is flawed because it does not improve the degraded quality of air in homes caused by the contaminated groundwater flow underneath the homes.

RESPONSE: The objective of the FFS to prevent contaminated groundwater from discharging into the creek system, not to prevent air contamination via vadose zone migration into homes. The U.S. EPA is concerned that the volatilization of carcinogenic organic compounds at the seep and from the creeks present a serious health hazard justifying this action.

(2) The FFS includes a misleading description of the site history.

RESPONSE: The U.S. EPA notes Cordova's comments. The relevancy of this history of ownership and who did what is not germane to the Proposed Plan. U.S. EPA will not comment on the subject at this time.

(3) The selected Remedial Alternative does not address the stated objectives.

(a) Cordova states that none of the criteria of the objectives are met by the remedial alternative.

RESPONSE: The U.S. EPA would once again like to remind the readers that, before the shallow aquifer was polluted, it was used as a potable water source. Although not the primary objective of the FFS, restoring the shallow groundwater system to its original, non-carcinogenic state is in the public interest. By removing contaminants from the source of the surface water contamination, namely the groundwater entering Little Bear Creek, the major objective of FFS is quite sufficiently met. As has been shown in the RI and reiterated in the FFS, the contaminated groundwater discharge is placing the resident in the vicinity of the discharge at unnecessary risk to their health and well being.

(b) The FFS does not evaluate how the selected remedial alternatives satisfies either the first or third objective as noted.

RESPONSE: Cordova Chemical and its consultant have selectively overlooked the evaluations provided in the FFS. U.S. EPA recommends review of Appendix A concerning groundwater extraction alternatives at Little Bear Creek and the unnamed tributary. The extraction alternatives clearly meet the first remedial action objective by intercepting and/or containing the contaminated groundwater of the unconfined system. The U.S. EPA, in addressing the third objective, would like to ask Cordova Chemical how this alternative is not compatible with potential actions at site? Any reduction of the amount of contaminants contained in the voluminous groundwater plume will only help in remedial efforts. Actions being considered currently in the development of the site FS must be compatible with the interceptor at Little Bear Creek in order to be cost effective, as well as remedially effective.

(4) The FFS does not properly evaluate Remedial Alternatives and inexplicably eliminates some alternatives.

(a) Cordova believes that additional data is needed in order to accurately analyze the effectiveness of the remedial alternatives, residual production, reliability, administrative feasibility and costs. Further, sludge generation rates and carbon utilization rates are clearly speculative.

RESPONSE: U.S. EPA believes that there is sufficient data available to proceed with the detailed evaluation of alternatives. We believe it is not necessary to 'reinvent the wheel' each time an engineered action is to occur. Data concerning most of the items are available in the literature and through standard engineering estimation techniques. Treatability studies have been performed previously on groundwater from the O/S/C site. U.S. EPA, as stated, is evaluating the results of bench-scale testing of the UV-process currently. U.S. EPA believes that Cordova Chemical expects a detailed design, at this stage, when in actuality, this is a feasibility study.

(b) Cordova Chemical believes the modelling approach in Appendix A, Groundwater Extraction Alternatives, using total organic contaminants of groundwater is inconsistent with Appendix B, Groundwater Treatment Evaluation.

RESPONSE: The difference in approach used in the Appendices is a function of their purpose. Appendix A, evaluating the dynamics of the groundwater system and the impact of the extraction system, used the total organic contaminant concentration (not "TOC") because of the extremely large number of pollutants found in the ground. It is impractical and unnecessary to model each contaminant separately. Appendix B, however, evaluated treatment technologies applicable to the waste stream (contaminated groundwater). The concentration and mass of the individual contaminants, as well as their physical/chemical properties, are essential to the technology evaluation. The U.S. EPA sees no incompatibilities in the use of each approach.

(c) There is an arbitrary determination to pretreat the waste for a broader range of organics and to higher quality than required by the Muskegon County Wastewater System.

RESPONSE: The U.S. EPA believes that in evaluating the requirement for treatment (and pretreatment), all applicable discharge requirements is necessary, as provided in the FFS. As stated in the NCP, a reduction of the toxicity and volume of contaminants is necessary. The choice of the treatment strategy is not arbitrary.

(d) The FFS fails to adequately consider and evaluate discharge to the POTW.

RESPONSE: Please refer to the response to Written Comment 9.3.b.

(e) The FFS does not consider land application beyond biological treatment.

RESPONSE: Land treatment of the waste was initially considered and screened out in the first screening. Previous experience by the POTW with O/S/C wastewater has demonstrated that the complex organics, namely aniline compounds, are not degraded in the land treatment system.

(f) Cordova feels the treatment method included in the selected remedial alternative is questionable because it does not address metals, inorganics and the unidentified organics. It appears that the granular activated carbon will exhaust rapidly and is economically prohibitive.

RESPONSE: The U.S. EPA believes that metals concentrations are related to background concentrations. We do not believe that inorganics in the groundwater will have an effect upon the proposed treatment scheme. Evaluating a treatment scheme which will remove and destroy the 'unknown' contaminants is definitely a challenge. U.S. EPA believes that the unknowns will be removed in the proposed treatment scheme. The cost associated with the use and regeneration of activated carbon have been considered in the FFS.

(5) The selected groundwater purge operation is based on inadequate data and inaccurate assumptions.

(a) There is insufficient information in the FFS and supporting documents to justify the simulated purge rates and the predicted effectiveness of the purge alternatives.

RESPONSE: Please refer to the response to Written Comment 5.10.

(b) There is no evaluation of the impact of the selected remedial alternative on the flow of Little Bear Creek, the unnamed tributary and the surrounding "wetland".

RESPONSE: The U.S. EPA believes that the evaluation of the impacts of contaminated groundwater on Little Bear Creek, the unnamed tributary, and the surrounding "wetlands" far outweighs the impacts caused by reduced flow and reduced contaminant input. The elimination of groundwater discharge in the unnamed tributary will reduce flow to that supplied by excess precipitation. The most notable change in the unnamed tributary will be the reduction in slime growth associated with the stream pollution. Surface water flow in Little Bear Creek will be reduced by that attributable to groundwater discharge. The majority of surface water flow in Little Bear Creek is associated with upgradient surface water runoff. The impact of the elimination on the surrounding wetland must be determined by emperical data.

A baseline study, performed during the remedial design phase of this action, will evaluate the current status of the ecosystem on specific ecological end-points to be determined. As suggested by the U.S. EPA Environmental Services, the baseline study will be compared to data generated during the remedial action, taking into account seasonal variations. The remedial actions are anticipated to have a positive effect upon the aquatic ecosystem and surrounding wetland which will be quantifiable.

(c) Cordova Chemical states that the groundwater purge well concentrations are based upon insufficient data nd inaccurate assumptions. The modelling programs used for the evaluation are also inappropriate.

RESPONSE: The U.S. EPA notes Cordova Chemical's concern about influent groundwater concentrations and the models used. We, however, believe that the assumptions and models used in the FFS to be appropriate for the evaluation of remedial actions for this site. We believe that Cordova's assertion that insufficient data is presented for their evaluation is untrue. Please refer to the response to Written Comment 7.25.

(6) The ARARs Analysis is vague and erroneous in several respects.

(a) RCRA and Michigan Hazardous Waste Management Act standards are not applicable because Cordova did not dispose of any hazardous wastes at the site and received clean closure certification for its storage facility in 1987.

RESPONSE: U.S. EPA is in receipt of material included in the Administrative Record for this site wherein the State of Michigan specifically lists Acts 64 and 245 as ARARs for the Ott/Story/Cordova site. U.S. EPA concurs with the State of Michigan in this regard.

(b) The ARAR's analysis is based upon the erroneous assumption that the affected aquifers are actual or potential drinking water sources.

RESPONSE: U.S. EPA reminds Cordova Chemical that before this aquifer was contaminated by operators of the facility, groundwater was used as the sole drinking water source. IF it were not for this reason, local residents would still be using the groundwater as a drinking supply. We consider these ARAR's as relevant and appropriate.

(c) The FFS erroneously applies certain state rules as ARARs.

RESPONSE: Please refer to the response to Written Comment 11.6.a.